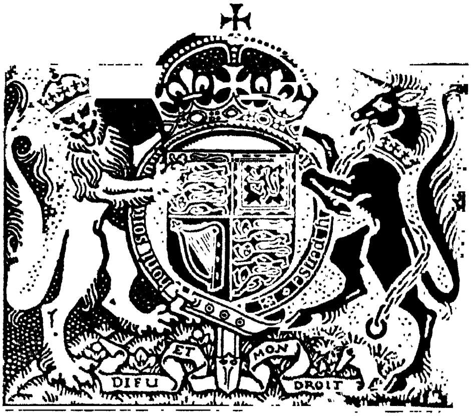
Honi soit qui mal y pense
DIEU ET MON DROIT

IMPERIAL AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI.

THE

PROCEEDINGS

OF THE

LINNEAN SOCIETY

OF

NEW SOUTH WALES.

(SECOND SERIES.)

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CORRIGENDA.

Page 20, line 34, and page 24, line 21—*for* EPEIRA SINUOSUS *read* EPEIRA SINUOSA.
Page 43, line 18—for *subcarinatus* read *subcarinata.*
Page 45, line 17—*for* family *Tabanidæ?* read *Eristalis cristata*, Walk., fam. *Syrphidæ.*
Page 202, line 30, page 203, line 19, page 204, lines 11, 13, 15, 21, page 205, line 1—for *Symphiletes* read *Symphyletes.*
Page 310, line 12—for *H. heterophyllus* read *H. heterophylla.*

PROCEEDINGS

OF THE

LINNEAN SOCIETY

OF

NEW SOUTH WALES.

WEDNESDAY, MARCH 29TH, 1893.

The President, Professor T. W. E. David, B.A., F.G.S., in the Chair.

DONATIONS.

(Received since the Meeting in December, 1892.)

"Nederlandsche Dierkundige Vereeniging—Tijdschrift." 2de Série, Deel iii, Afl. 3 en 4 (October, 1892): "Catalogus der Bibliotheek" (Derde Uitgave), Eerste Vervolg (June, 1884, to December, 1891): "Wet van de Nederlandsche Dierkundige Vereeniging" (December, 1891). *From the Society.*

"Nederlandsche Entomologische Vereeniging—Tijdschrift voor Entomologie." xxxv. Deel, Afl. 1 en 2 (1892). *From the Society.*

"Zoologischer Anzeiger." xv. Jahrg. Nos. 406-408 (November-December, 1892); xvi. Jahrg. Nos. 409-412 (January-February, 1893). *From the Editor.*

"Zoological Society of London—Abstracts." November 19th, December 6th and 20th, 1892. *From the Society.*

"Société Scientifique du Chili—Actes." Tome ii. 1re et 2^{me} Livraisons (1892). *From the Society.*

"Pharmaceutical Journal of Australasia." Vol. v. (1892), No. 12; Vol. vi. (1893), Nos. 1-2. *From the Editor.*

"United States Department of Agriculture—Division of Entomology—Insect Life." Vol. v. Nos. 2-3 (November, 1892, to January, 1893). *From the Secretary of Agriculture.*

"American Naturalist." Vol. xxvi. (1892), No. 312 (December); Vol. xxvii. (1893), Nos. 313-314 (Jan.-Feb.). *From the Editors.*

"Société Belge de Microscopie—Bulletin." Tome xix. (1892-93), Nos. 1-3. *From the Society.*

"Royal Society of Canada—Proceedings and Transactions for the year 1891." Vol. ix. *From the Society.*

"Royal Society of South Australia—Transactions." Vol. xv. Part 2 (1891-92); Vol. xvi. Part 1 (1892-93). *From the Society.*

"Perak Government Gazette." Vol. v. Nos. 38-39 (December, 1892); Vol. vi. Nos. 1-5 (January-February ,1893). *From the Government Secretary.*

"Victorian Naturalist." Vol. ix. Nos. 9-11 (January-March, 1893). *From the Field Naturalists' Club of Victoria.*

"Naturforschende Gesellschaft zu Freiburg, i/B.—Berichte." vi. Band, 1-4 Heft (1891-92). *From the Society.*

"Department of Mines and Geological Survey of N.S.W.—Records." Vol. iii. Part 2 (1892). *From the Hon. the Minister for Mines.*

"Australasian Journal of Pharmacy." Vol. viii. (1893), Nos. 85-87 (Jan.-March). *From the Editor.*

"Agricultural Gazette of N.S.W." Vol. iii. (1892), Part 12; Vol. iv. (1893), Parts 1-2. *From the Director of Agriculture.*

Pamphlet entitled—"A new British Hepatic." By W. H. Pearson (1891). *From the Author.*

"Royal Microscopical Society—Journal, 1892." Part 6; 1893. Part 1. *From the Society.*

"Geology and Palæontology of Queensland and New Guinea." Text, Plates, and Maps, 3 Vols. (1892). By R. L. Jack, F.G.S., F.R.G.S., and R. Etheridge, Junr. *From the Authors.*

Six Entomological Pamphlets, by the Rev. T. Blackburn, B.A. *From the Author.*

"Nova Scotian Institute of Natural Sciences, Halifax—Proceedings and Transactions." Vol. viii. Parts 1-3 (1886-89). *From the Institute.*

"Erythea." Vol. i. No. 1 (January, 1893). *From Baron Ferd. von Mueller, K.C.M.G., F.R.S., &c.*

"Geological Survey of India—Records." Vol. xxv. Part 4 (1892). *From the Director.*

"Entomologisk Tidskrift utgifven af Entomologiska Föreningen i Stockholm." Arg. xiii. (1892), Häft. 1-4. *From the Society.*

"American Museum of Natural History—Bulletin." Vol. iv. No. 1, pp. 193-386 (Sheets 13-24); Title-page and Index to Vol. iv. *From the Museum.*

"Cincinnati Society of Natural History—Journal." Vol. xv. No. 2 (July, 1892). *From the Society.*

"American Academy of Arts and Sciences — Proceedings." New Series, Vol. xviii. (1891). *From the Academy.*

"Missouri Botanical Garden—Third Annual Report" (1892). *From the Trustees.*

"New York Academy of Sciences—Transactions." Vol. x. (1890-91), Nos. 1 and 7-8; Vol. xi. (1891-92), Nos. 1-5: "Annals." Vol. vi. (1891-92), Nos. 1-6. *From the Academy.*

"Société Entomologique de France — Annales." Tome lx. (1891-92). *From the Society.*

"Société Zoologique de France—Bulletin." Tome xvii. (1892), Nos. 3 and 6. *From the Society.*

"Société des Sciences Naturelles de l'Ouest de la France—Bulletin." Tome ii. No. 3 (1892). *From the Society.*

"Naturforschender Verein in Brünn—Verhandlungen." xxix. Band (1891): ix. Bericht der meteorologischen Commission (1891). *From the Society.*

"Kaiserliche Leopoldino-Carolinische deutsche Academie der Naturforscher—Leopoldina." xxvii. Heft (1891): "Nova Acta." Band lv. Nr. 4 u. 6; Band lvii. Nr. 3 u. 4; Band lviii. Nr. 1 (1890-92). *From the Academy.*

"Académie Impériale des Sciences de St. Pétersbourg—Mémoires." vii^{e} Série, Tome xxxviii. Nos. 9-10 (1892). *From the Academy.*

"Museo Civico di Storia Naturale di Genova—Annali" (1890-92). Série 2^{a}, Vols. x.-xi. *From the Director.*

"Australian Museum, Sydney—Catalogue, No. 16—Australian Mammals." By J. D. Ogilby, F.L.S. (1892): "Records." Vol. iv. No. 4 (February, 1893). *From the Trustees.*

"Gesellschaft für Erdkunde zu Berlin—Verhandlungen." Band xix. Nos. 9 u. 10 (1892); Band xx. No. 1 (1893): "Zeitschrift." Band xxvii. Nos. 4-5 (1892). *From the Society.*

"Royal Physical Society of Edinburgh—Proceedings." Session cxxi. *From the Society.*

"K. K. Naturhistorisches Hofmuseum in Wien—Annalen." Band vi. Nr. 3 u. 4 (1891); Band vii. Nr. 1 u. 2 (1892). *From the Director.*

"Department of Agriculture, Brisbane—Annual Report for the year 1891-92; Bulletin Nos. 20-21" (January-February, 1893). *From the Under-Secretary for Agriculture.*

"Smithsonian Institution—United States National Museum—Bulletin." No. 40. *From the Museum.*

"University of Melbourne—Matriculation Examination Papers" (November, 1892). *From the University.*

Three Conchological Pamphlets, by Edgar A. Smith, F.Z.S. *From the Author.*

"Canadian Institute—Transactions." Vol. iii. Part 1 (December, 1892). *From the Institute.*

"Johns Hopkins University Circulars." Vol. xii. No. 102 (January, 1893). *From the University.*

"Museum of Comparative Zoology at Harvard College—Annual Report for 1891-92: Bulletin." Vol. xxiii. Nos. 4-5 (December, 1892). *From the Curator.*

"Journal of Conchology." Vol. vii. Nos. 4-5 (1892-93). *From the Conchological Society of Great Britain and Ireland.*

"Asiatic Society of Bengal—Journal." Vol. lxi. Part i. No. 3 (1892): "Proceedings, 1892." Nos. 8 and 9. *From the Society.*

"Royal Irish Academy—Proceedings." Third Series, Vol. ii. No. 3 (December, 1892): "Transactions." Vol. xxx. Parts 3-4 (1892-93). *From the Academy.*

"Geological Society of London—Quarterly Journal." Vol. xlix. No. 193 (February, 1893). *From the Society.*

"Société d'Horticulture du Doubs, Besançon—Bulletin." Nouvelle Série, Nos. 24-25 (December, 1892, to January, 1893). *From the Society.*

"Royal Society of N.S.W.—Journal and Proceedings, 1892." Vol. xxvi. *From the Society.*

"Société Nationale des Sciences Naturelles de Cherbourg—Mémoires." Tome xxviii. (1892). *From the Society.*

"Société Royale de Géographie d'Anvers—Bulletin." Tome xvii. 1^{er} Fasc. (1892). *From the Society.*

"Entomological Society of London — Transactions, 1892." Parts 4-5. *From the Society.*

"Bombay Natural History Society—Journal." Vol. vii. No. 3 (1892). *From the Society.*

"Department of Mines, Victoria—Special Reports: Victorian Coal-Fields." By J. Stirling, F.G.S. (1892). *From the Hon. the Minister for Mines.*

"College of Science, Imperial University, Japan—Journal." Vol. v. Part 3 (1893). *From the University.*

"American Geographical Society—Bulletin." Vol. xxiv. No. 4, Part 1 (1892). *From the Society.*

"University of Pennsylvania—Contributions from the Botanical Laboratory." Vol. i. No. 1 (1892). *From the University.*

"Auckland Institute and Museum—Annual Report for 1892-93." *From the Museum.*

"Results of Rain, River, and Evaporation Observations made in N. S. Wales during 1891"; "Results of Meteorological Observations made in N. S. Wales during 1890"; "Diagram of Isothermal Lines of N. S. Wales"; "Hail Storms." By H. C. Russell, B.A., C.M.G., F.R.S. *From the Government Astronomer, Sydney.*

Pamphlet entitled—"Projet d'Observatoires Météorologiques sur l'Océan Atlantique." By H.R.H. Prince de Monaco. *From the Author.*

PAPERS READ.

ON *DINORNIS (?) QUEENSLANDIÆ.*

By Captain F. W. Hutton, F.R.S., Hon. Mem. L.S. of N.S.W.,
Curator of the Canterbury Museum, Christchurch.

In the Proceedings of the Royal Society of Queensland for 1884, Mr. C. W. De Vis has described a struthious femur, found at King's Creek, Darling Downs, under the name of *Dinornis Queenslandiæ,* and says that it "agrees almost exactly with the femurs of *D. crassus* and *D. elephantopus.*" Mr. R. Etheridge, junr., has also expressed his opinion that "there is a close resemblance between this bone and the femur of *Dinornis.*"* A few months ago Mr. De Vis was kind enough to send a cast of this specimen to the Canterbury Museum as an exchange, and a careful examination of it has convinced me that it is quite distinct from the femora of the New Zealand Moas and cannot be included in any of our genera. It is, therefore, necessary for me to state my reasons for disagreeing with the two distinguished palæontologists just mentioned.

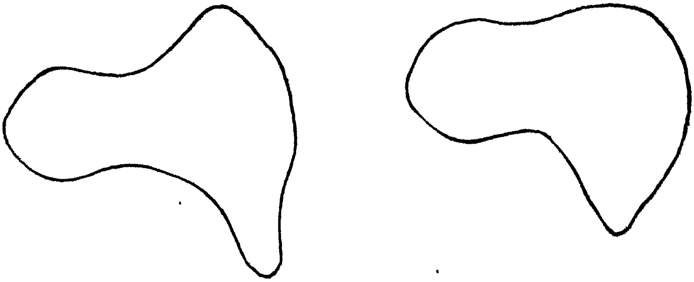
The specimen consists of the proximal end of a left femur, about the size of that of *Euryapteryx ponderosa*, but, being broken, the fragment is now only between four and four and a-half inches in length. Also the proximal surface has been worn down nearly to the level of the middle articular surface, so that both the trochanterial articular surface and the upper side of the head have gone. It is therefore impossible to say whether the trochanter rose higher than the head, a feature which is so characteristic of the femora of the Moas. But even now the characters left are quite sufficient to distinguish the fragment from the femur of any New Zealand bird.

---

* Geology of Queensland, Jack and Etheridge, Vol. i. p. 626.

Among the Dinornithidæ, the nearest approach I can find to the specimen is the femur of *Euryapteryx ponderosa*, which is much the same size. But a proximal view of both shows great differences in the shape of the trochanter and the ecto-trochanterial surfaces. This will at once be seen by an examination of the figures annexed, which are in each case one-third the natural size.

PROXIMAL VIEW OF FEMUR (⅓ nat. size).



Dinornis (?) Queenslandiæ. *Euryapteryx ponderosa.*

When the axes of the heads of each bone are placed parallel, it will be seen that the trochanter in the Queensland specimen extends much more posteriorly than in the New Zealand bone, so that the posterior margin of the articular surface in the Queensland specimen forms a deep curve, which might almost be described as an angle, while in *Euryapteryx* the same margin is only gently sinuated. Anteriorly, also, in the Queensland fossil the trochanter is narrower, projects more, and is slightly concave on the outer anterior margin; while in the New Zealand bird the ecto-trochanterial surface is markedly convex.

The proximal end of the femur of *Euryapteryx gravis* has much the same shape* as in *E. ponderosa;* while, if the Queensland bone is compared with the femur of any other genus of the Dinornithidæ, the differences will be found to be still greater, as a glance at *Dinornis giganteus* in Owen's "Extinct Birds of New Zealand," pl. 36, fig. 1, or at *Mesopteryx casuarina,* on pl. 38, fig. 2, will show. *Pachyornis elephantopus*, on pl. 56, fig. 2, comes rather nearer, and *Pachyornis (?) geranoides*, on pl. 68, fig. 6, still more so; but none are so close, either in form or in size, as *Euryapteryx ponderosa*, which I have figured. In none of the Dinornithidæ is there the marked backward projection of the trochanterial surface as is shown in the Queensland fossil, and it is plain, therefore, that it can be at once distinguished from them and should be put into a separate genus.

---

* See Owen's "Extinct Birds of New Zealand," pl. 41A, fig. 2.

Now comes the question, Does the Queensland bird belong to the Dinornithidæ at all? It may be said that the differences pointed out are small; but then we must remember that the specimen itself is only a fragment, with most of the parts which give special Dinornithidian characters absent; and if in so small a fragment we find a character which easily distinguishes it from all the Dinornithidæ and Apterygidæ, we may well suppose it probable that when more is known of the Queensland bird we shall find many other characters in which it differed from the Moas; and to call it a Moa when the chances are much against its being a Moa would only lead to erroneous conclusions in questions relating to the origin and dispersal of the struthious birds.

But if the Queensland bird does not belong to the Dinornithidæ, to what family should it be referred?

The posterior projection of the trochanterial surface, which is the character by which the King's Creek fossil can be distinguished from all the Dinornithidæ and Apterygidæ, is present in the femora of both the Cassowary and the Emu, but not much developed. In the femur of the young Emu, however,* this character is quite as strong as in the King's Creek fossil. It is evidently a family characteristic of the Casuariidæ, and I am therefore inclined for the present to place the King's Creek fossil in that family. It probably represents the ancestors of the Emus and Cassowaries, for it shows a closer resemblance to the young Emu than to any other bird with which I have been able to compare it.

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* I have not the femur of a young Cassowary for comparison.

It remains to discuss its relations with *Dromornis*.

The femur of *Dromornis australis* from Peak Downs, although crushed and abraded, shows the same backward projection of the trochanterial surface, but it is impossible to say whether this projection was so great as in the King's Creek fossil. In the King's Creek fossil, however, the neck is better developed, and the middle portion of the articular surface is convex fore and aft, as it is in the Emu and Cassowary. The only other important difference appears to be the great compression of the shaft in *Dromornis*, which is much flatter than in any other struthious bird. The King's Creek fossil is intermediate between *Dromornis* and the living Casuariidæ, and I see no reason why it should not be included in the same family with the Cassowary and Emu, even if *Dromornis* be excluded. The absence or presence of a pneumatic foramen in the femur cannot be reckoned as a family character any more than size.

NOTE ON THE UPPER INCISOR OF *PHASCOLONUS.*

By C. W. De Vis, M.A., Corr. Mem.

(Plate I.)

A lately acquired remnant of the upper jaw of a *Phascolonus gigas* throws a welcome light on the nature of its incisor. The fragment consists of the left premaxillary with a portion of the nasal, and so much of the maxillary as includes the anterior wall of the alveolus of the premolar. This socket has been occupied by a curved columnar prismatic tooth, angular in front, such as is exemplified by a loose premolar of *Phascolonus* now in evidence, and such as is required to fill an empty socket in another specimen. On these grounds alone, apart from others to be adduced hereafter, the derivation of the fossil from *Phascolonus* may be confidently affirmed. Included in it is the greater part of an incisor. At its outlet, where its free portion has been broken away, its section is an oval, constricted in the middle of its length, 42 mm. in its vertical and 22 mm. in its transverse diameter; measurements which indicate an unexpected robustness of form. The lateral constriction, increasing as it recedes, forms on the exposed surface of the inner side of the tooth a broad deep groove, which, with a similar channel on the opposite side, partially divides the fang into two unequal columns, the lower of them being the larger. The end of this lower one is broken away ; the smaller and upper column rapidly contracts with a striated and puckered surface to the edge of a funnel-shaped cavity, at the bottom of which is a loop-shaped adit into the interior of the column. The ends of the two columns were at some distance apart and not in the same vertical line.

It has for some time been suspected by the writer that the *Phascolonus* incisor would prove to end in this manner ; it was an opinion based on certain features in the alveoli of a maxillary from which all the teeth have been lost. This is broken in such a way as to expose the ends of the sockets of the premolar and first true molar. Just above and behind the apex of the molar alveolus there is a deep round cavity which does not form part of that alveolus, and, similarly situated in relation to the premolar socket, is a smaller cavity of the same kind more distant from the axis of the skull and on a lower level than the other and separated from it by a sepiment of bone. These two cavities have evidently received ends of the fang of an incisor similar to the ends exposed in the fossil premaxillary. As the shape and size of the alveoli in this specimen prove it to have belonged to the skull of *Phascolonus* we have in it a confirmation of the validity of the reference of the incisor to that genus.

Among a number of large teeth which have at various times been set aside as incapable of recognition is a nearly entire right incisor, smaller than, but in all essential points agreeing with, that of the present fossil, the chief differences being that its lateral grooves are narrower, the columns formed by them less unequal in size, and their extreme ends apparently not so far separated from each other, but the last particular is uncertain, as the part is much mutilated. The anterior portion of this tooth tapers slowly from the outlet forwards; the lateral grooves are continued to the cutting edges; the enamel investment of the upper surface extends over the inner but not over the outer groove, consequently the inner edge of the surface of wear is the longer, and it formed with that of the contiguous tooth a sharp longitudinal ridge from which the abraded surface of dentine slopes outward and upward to the outer angle of the enamelled edge. The worn surface of the tooth is undulatory and 37·5 mm. in length. The whole tooth is 145 mm. long; at its thickest part near the centre its diameters are 31·5 and 26·5. It has a moderate curve in its whole length and is more curved on its upper than on its lower surface.

The discovery of this tooth must set aside all speculation as to the identity of *Sceparnodon* with *Phascolonus*.

The premaxillary fossil is from Cambooya, the maxillary from Chinchilla, both localities on the Darling Downs.

DESCRIPTION OF A NEW SPECIES OF *ACACIA.*

By Baron von Mueller, K.C.M.G., M. & Ph.D., F.R.S., and
J. H. Maiden, F.L.S., F.C.S.

(Plate II.)

Acacia Jonesii.

Branchlets beset with minute hairlets, not angular; leaves on very short petioles; pinnules in 6 or 5 or rarely less pairs, rather distant, almost sessile, rachis minutely puberulous, bearing a very small depressed glandule between each racheole; leaflets in 16 or less pairs, quite small, linear- or narrow-elliptical, glabrous, concave, with an acute somewhat recurved apex, on both sides of the same deep green; flower-headlets simply racemous, their peduncles of somewhat less length during anthesis and like the rachis and flowers nearly or quite glabrous; bracts very much shorter than the flowers; calyx about as broad as long, sinuate-five-denticulate, of somewhat less than half the length of the corolla; fruit much compressed, rather narrow, only slightly curved, glabrous; seeds placed almost diagonally, occupying most of the breadth of the valves, broadly ovate, rather turgid, deep black, somewhat shining, their lateral areoles large, but of faint demarcation; funicle very short and almost straight; strophiole whitish, dimidiate-ovate and somewhat cymbiform, of one-third or hardly half the length of the seed.

Near Barber's Creek, in the Goulburn district, New South Wales; H. J. Rumsey.

As far as seen, this plant appears to be of exceedingly local distribution, being confined to an area of about an acre. It is a dwarf shrub, 2 to 3 feet high, with a stem-diameter only to ¾ of an inch. Leaf-rachis generally 1-1½ inches long. Pinnules seldom exceeding an inch in length and some shortened to half an inch. Leaflets ⅛ to ¼ inch long. Racemes mostly axillary and solitary, usually much longer than the leaves. The rachis of each raceme very flexuous. Flowers in the headlets not very numerous. Fruit 1½-3 inches long, ¼-⅓ inch broad, usually devoid of conspicuous marginal sinuosity, the valves of rather thin texture. Seeds mostly about ⅙ inch long.

This species differs from *A. pubescens* in much shorter indument, less closely approximated and fewer pinnules, somewhat channelled and distinctly pointed leaflets, rachis-glandules present at all the pinnules, broader racheole, larger headlets of flowers on shorter stalklets, glabrous, shorter and seemingly never paniculated racemes; but in carpological characteristics both species are much alike, except that the valves of *A. pubescens* are less coriaceous, narrower, more constricted between the seeds, while the seeds themselves are proportionately narrow and placed longitudinally. From *A. Baileyana*, which was more recently collected by Mr. Garland and Mr. Coker also between the Murrumbidgee and Lachlan Rivers, our new species is distinguished chiefly in pinnules always more numerous to each leaf and much narrower in outline, in leaflets less blunt, with the median line very faint and not near the anterior margin, neither glaucous nor flat, in racemes shorter, with also less elongated stalklets to the headlets, in fruits narrower with less space left between the seeds and the sutures of the valves.

From *A. polybotrya*, recorded now also from Wybong Creek, a tributary of the Hunter River, the new congener is distinguished by leaves much smaller and always glabrous, with neither bluntish nor flat and also less inequilateral leaflets, by fruits of lesser size with seeds placed more longitudinally, and by the funicle enlarging into a very conspicuous strophiole.

From *A. leptoclada* it recedes strikingly in the absence of copious long spreading hairlets on the branchlets and headlets, in leaves more numerously pinnulate and probably also in characteristics of well-developed flowers and fruits, neither of which are as yet available for comparison, though the plant has further been collected in New England by the late Rev. R. Collie, F.L.S.

From *A. cardiophylla*, which is now also known from the vicinity of the Lachlan River through Mr. J. Duff, *A. Jonesii* deviates in leaflets seemingly never puberulous, evidently longer but proportionately narrower and forming longer pinnules, in calyces neither deeply lobed nor ciliolated, and again the carpologic comparisons in this instance cannot yet be fully carried out. Finally there should still be alluded to a resemblance of *A. decurrens* in its variety *paucijuga* from far inland regions; but the branchlets of our new species are not angular, the petioles are very short, the leaflets pointed, darker green, more concave and less slender, the inflorescence less compound and the fruits smaller. The *A. decurrens* var. *Leichhardtii* (Benth. Fl. Austral. II., 415) has, however, to be raised to specific rank, as it is distinct both from *A. decurrens* and *A. pubescens*. The late Mr. J. O'Shanesy sent it from the environs of Wide Bay, Queensland, but also in an imperfect state; it has received the name of *A. O'Shanesii.*

This dwarf floriferous and pretty *Acacia*, well worthy of a place in gardens, is named in honour of Dr. Sydney Jones, President of the Australasian Medical Congress at Sydney, whose distinguished reputation is only equalled by his munificence in the cause of medical science.

EXPLANATION OF PLATE II.

Acacia Jonesii.

1. Flowering twig.
2. Flower-bud.
3. Expanded flower.
4. Front and back view of stamens.
5. Ovulary.
6. Ripe pod.
7. Seed.
8. Leaf-rachis, showing glandules.
9. Portion of a phyllode.

(All enlarged, but to various extent, except 1 and 6.)

DESCRIPTIONS OF SOME NEW ARANEIDÆ OF NEW SOUTH WALES. No. 2.

By W. J. Rainbow.

(Plate III.)

Family EPEIRIDÆ.

This family has a wide geographical range, and representatives of it are met with in countries varying greatly in temperature. They are, for the most part, sylvan in their choice of locality, though many of them construct their orbitular snares under eaves of buildings, verandahs, and other prominent and exposed positions. Both as regards size, form, structure and consistency of their integument there are many interesting and remarkable contrasts, in which respect the Australian species present some notable examples. Many of the *Epëiridæ* are also remarkable for their bright and gorgeous colours, of which the genera *Epëira*, *Argiope*, *Nephila*, *Arcys*, &c., supply most interesting types.

Of the species described in the present paper, all are representatives of *Micro-Araneidæ*, and with the exception of *Anepsia crinita*, each is endowed in life with more or less bright and striking colours.

Genus EPEIRA, Walck.

Epeira diversicolor, sp.nov.

(Plate III. figs. 1, 1a, 1b.)

♀. Cephalothorax, 1·3mm. long, 1 mm. broad; abdomen, 2 mm. long, 1 mm. broad.

Cephalothorax dark glossy mahogany-brown, glabrous. *Caput* somewhat elevated, rounded on sides and upper part; normal grooves and indentations indistinct. *Clypeus* broad, moderately convex, and with a strong deep indentation posteriorly. *Marginal band* narrow, dull black, sparsely furnished with minute black hairs.

Eyes of pearl-grey lustre; the four intermediate ones are seated on a prominence, forming a square, or nearly so, and are the largest of the eight; the lateral pairs are much the smallest, and are placed obliquely on small tubercles, but are not contiguous.

Legs long, moderately strong, pale yellow with dark annulations at joints, and each furnished with long coarse blackish hairs and small spines; relative lengths, 1, 2, 4, 3.

Palpi long, strong; the first, second, third and fourth joints pale yellowish; fifth yellowish-brown at base, but deepening to dark brown at tips; similar in armature to legs.

Falces glossy mahogany-brown, powerful, articulated on inclined plane, furnished with a few short yellowish sessile hairs, and armed with teeth on the inner surface.

Maxillæ concolorous, short, strong, slightly concave at apex.

Labium concolorous, short, broad, and rounded off at apex.

Sternum elliptical, dark brown, sparsely furnished with short hoary hairs.

Abdomen ovate, projecting over base of cephalothorax, convex above, furnished with long white and a few short black hairs; colour ochreous-yellow, with large, prominent, dark-brown patch towards anterior extremity, the outer margin of which is ochreous-red; there are also two narrow and somewhat sinuous longitudinal ochreous-red stripes commencing towards the centre and terminating at the abdominal extremity; the space between these stripes is ochreous-yellow, mottled with reddish-brown; besides these there are also four large black spots near the middle, and a few exceedingly minute ones distributed over the upper surface. The sides of the abdomen are furnished with curved oblique markings, of a dark brown colour, which unite near the upper surface; the colour of the spaces in between these is ochreous-yellow, mottled with dark brown. Inferior surface convex, black, with a rather large patch of bright yellow between spinnerets and epigyne.

Epigyne a long transverse, curved slit, curvature directed forwards; upper lip with a tolerably strong indentation at centre.

Hab.—Sydney.

EPEIRA PULCHRA, sp.nov.

(Plate III. figs. 2, 2a, 2b, 3, 3a.)

♀. Cephalothorax, 1·5 mm. long, 1 mm. broad; abdomen, 2 mm. long, 2 mm. broad.

Cephalothorax yellow-brown, sparsely furnished with a few long hoary hairs. *Caput* elevated, rounded on sides and upper part, normal grooves and indentations distinct; ocular area furnished with a few long, coarse, hoary hairs. *Clypeus* broad, convex, darker than cephalic eminence. *Marginal band* narrow, nearly black, fringed with short black hairs.

Eyes arranged as in *E. diversicolor.*

Legs long, strong, pale yellow, with dark annulations, and furnished with long strong yellowish hairs, and short strong spines; relative lengths, 1, 2, 4, 3.

Palpi concolorous, long, strong, and similar in armature to the legs.

Falces yellowish, rather darker at base and extremities, furnished with a few short hairs, and armed with teeth on the inner surface.

Maxillæ yellowish; short, strong, broad, convex, inclined inwards; thickly fringed with short strong hairs at inner margin of apex, a few short black ones on outer extremity.

Labium concolorous, coniform, furnished with fringe of short blackish hairs at apex.

Sternum yellow-brown, shield-shaped, broad, sparsely clothed with long white hairs.

Abdomen broad-ovate, projecting over base of cephalothorax, convex, furnished with a few long strong hairs; a large, dark, leaf-like mark, mottled with bright yellow, whose lateral markings are sinuous, and which tapers to the spinnerets, commences nearly midway, and extends along the middle; a broad bright yellow patch, delicately marked with irregular brown tracings, and also divided by a rather broad median dark brown band, is seated at anterior extremity; sides and inferior surface mottled with patches of black and bright yellow.

Epigyne convex, broad, dark brown; *branchial opercula* dark brown also.

Hab.—Sydney.

♂. Cephalothorax, 1 mm. long; abdomen, 1·3 mm. long.

The male differs but little from the female in general appearance. The *cephalic eminence* is rather darker, as is also the *clypeus*, which towards the marginal band is nearly black. The legs are a paler yellow than those of the ♀, and the annulations somewhat darker.

Palpi short, similar in colour to the legs, furnished with long hairs, and complicated.

Falces yellow. *Maxillæ, labium,* and *sternum* darker than those of the female.

Abdomen broadly-ovate, projecting over base of cephalothorax; similar in colouration to the female, but the yellow patch at anterior extremity is furnished with two rather large dark brown spots, and is not divided with a median band as in the ♀ example.

Hab.—Sydney.

EPEIRA RUBRIPUNCTATA, sp.nov.

(Plate III. fig. 4.)

♀. Cephalothorax, 2 mm. long, 1·5 mm. broad; abdomen, 2·5 mm. long, 2 mm. broad.

Cephalothorax yellowish, somewhat compressed before. *Caput* elevated, rounded on sides and upper part; normal grooves and indentations distinct. *Clypeus* yellowish, faintly suffused with red at broadest part, convex, furnished with short yellowish hairs. *Marginal band* narrow, rather dark, fringed with short yellowish hairs. *Cephalic segment* deep reddish-brown at base, becoming gradually lighter towards apex, which is light reddish-brown at summit and pale yellow laterally, furnished with a few long strong coarse hairs; there is also a fringe of short yellowish hairs in front and below ocular area.

Eyes of an opaline tint; the four intermediate eyes seated on a prominence, nearly forming a square; the two anterior ones are rather the widest apart, and are the largest of the eight; the eyes of each lateral pair are placed obliquely on a small tubercle, but are not contiguous.

Legs long, moderately strong, yellow-brown, trochanters and tibiæ of all four annulated dark brown; relative lengths, 1, 2, 4, 3; each is furnished with long coarse hairs and strong spines.

Palpi long; first, second, and third joints pale yellowish, fourth and fifth rather darker; armature similar to that of legs.

Falces strong, yellowish, furnished with a few short strong black bristles, and armed with teeth on the under side.

Maxillæ short, strong, rounded at extremity, furnished with a few rather long and strong black hairs; yellowish, suffused with bistre.

Labium concolorous, short, broad, rounded off at apex.

Sternum concolorous, broad, shield-shaped, sparingly clothed with hairs.

Abdomen ovate, outline somewhat sinuous, projecting over base of cephalothorax, moderately convex above, furnished with a few short white hairs; colour, silvery-white, dotted over with numerous small red spots, besides which there are six large spots of a reddish-brown colour, placed in three rows; those of the first row are somewhat the largest of the six and the widest apart, and those of the third row the smallest and closest together; there are also two large sinuous black lateral bands on superior surface which are pointed, the points being directed outwards; inferior surface black, sides pale yellowish with black flecks.

Epigyne broad, moderately convex, furnished with a long articulated membranous process, which is directed forwards; colour yellowish.

Hab.—Manly.

EPEIRA SINUOSUS, sp.nov.

(Plate III. fig. 6.)

♀. Cephalothorax, 2 mm. long, 1·5 mm. broad; abdomen, 3 mm. long, 2 mm. broad.

Cephalothorax yellowish, hairy. *Caput* elevated, rounded on sides and upper part, normal grooves distinct. *Clypeus* convex, thickly furnished with long hoary hairs; colour yellowish, a dark brown patch in centre, sides suffused with orange-red. *Marginal band* narrow, anterior portion dark brown, latter portion pale yellow. *Cephalic segment* dark brown at base, apex and sides yellow-brown, furnished with short hoary hairs.

Eyes similar to those of *E. rubripunctata.*

Legs long, moderately strong, yellow, with dark brown annulations, furnished with coarse hairs and short strong spines; relative lengths, 4, 1, 2, 3.

Palpi long and similar in colour and armature to legs.

Falces hairy, outer margins yellow-brown, front and inner margins nearly black; a row of teeth along margins of each falx on underside.

Maxillæ short, strong, somewhat club-shaped, black, furnished with a few short black hairs.

Labium concolorous, short, broad at base, rounded off at apex.

Sternum concolorous also, shield-shaped, sparsely furnished with short hairs.

Abdomen ovate, outline sinuous, elevated in front, projecting over base of cephalothorax, moderately convex, furnished with short hoary hairs; four somewhat deep punctures, forming a square at middle of superior surface; fulvous spotted with red; posterior extremity dark; there is also a large patch of dark brown in front, the border of which is tinged with red; inferior surface dark brown; a long articulated membranous flesh-coloured process, directed forwards, and similar to *epigyne* of *E. rubripunctata* is in connection with the prominent sexual organ.

Hab.—Sydney.

EPEIRA HAMILTONI, sp.nov.

(Plate III. figs. 7, 7a.)

♀. Cephalothorax, 2 mm. long, 1·5 mm. broad; abdomen, 3 mm. long, 2 mm. broad.

Cephalothorax yellow-brown, furnished with a few rather long coarse yellowish hairs. *Caput* elevated and rounded on sides and upper part, normal grooves and indentations distinct, pale yellow at apex. *Clypeus* broad, convex, a strong deep depression at posterior extremity; yellow-brown with dark lateral markings radiating from near the centre. *Marginal band* narrow, dark, and furnished with a fringe of dark minute hairs.

Eyes glossy black, elevated on rings; four intermediate eyes largest of group, forming a square or nearly so; those of each lateral pair seated on tubercles, and nearly contiguous.

Legs long, moderately strong, yellow-brown with dark annulations at joints; relative lengths, 1, 2, 4, 3; furnished with strong coarse hairs and short black spines; each *tarsus* terminates with four curved claws, the three superior ones of which are much the longest and strongest, and have a row of teeth near their base on the underside.

Palpi long, strong, similar in colour and armature to the legs.

Falces yellow-brown, furnished with a few strong coarse bristles; a row of teeth along margins of each falx on underside.

Maxillæ pale yellow, short, strong, furnished with short yellowish hairs.

Labium concolorous, broad at base, narrow and rounded off at apex.

Sternum cordate, glossy black, furnished with a few yellowish hairs.

Abdomen ovate, moderately convex, projecting over base of cephalothorax, furnished with short yellowish sessile hairs; colour of superior surface dark brown, pale yellowish laterally; a large leaf-like design, mottled with pale yellow and dark brown, whose lateral margins are dark brown and sinuous, and which tapers to the spinnerets, extends along the middle; inferior surface dark brown with yellowish lateral patches, and furnished with a few short yellowish sessile hairs.

Epigyne a long transverse slit, with a short, bluntish dark-coloured membranous process directed forwards.

Hab.—Guntawang, near Mudgee.

I have much pleasure in dedicating this species to my esteemed correspondent, Mr. A. G. Hamilton, of Mount Kembla, to whose kindness I am indebted not only for the specimen herein described but for other interesting types from the same neighbourhood.

Genus ANEPSIA, Koch.

ANEPSIA CRINITA, sp.nov.

(Plate III. figs. 5, 5a.)

♀. Cephalothorax, 2·5 mm. long, 2 mm. broad; abdomen, 3 mm long, 2 mm. broad.

Cephalothorax yellow-brown, striated with bistre, and clothed with long coarse yellow hairs. *Caput* elevated, convex; normal grooves and indentations distinct. *Clypeus* broad, moderately convex, with a strong deep indentation posteriorly. *Marginal band* narrow, dark, fringed with short black hairs.

Eyes dark; the four intermediate ones seated on a somewhat quadrangular protuberance, forming a square, are of equal size, and much the largest of the eight; the eyes of each lateral pair minute, placed obliquely on a small tubercle, and not contiguous.

Legs long, moderately strong, yellow-brown, with dark brown annulations, hairy, and furnished with moderately long and strong spines; relative lengths, 1, 2, 4, 3.

Palpi long, strong, and similar in colour and armature to the legs.

Falces yellow-brown, articulated on inclined plane, clothed with yellowish hairs which are thickest at base and inner margins; a row of teeth along margins of each falx on the underside.

Maxillæ short, strong, broadest at apex, which is rounded off; yellowish, furnished with hairs and a few short rather strong spines.

Labium concolorous, short, broad, and rounded off at apex.

Sternum broad, shield-shaped, dark brown approaching black, sparsely furnished with short yellowish sessile hairs.

Abdomen broad-ovate, somewhat compressed towards posterior end, projecting over base of cephalothorax, dull dark brown, mottled with a few yellowish flecks; a large leaf-like mark, the lateral margins of which are sinuous, and which tapers towards the spinners, faintly visible; superior surface thickly clothed with short dark hairs; there is also a rather thick fringe of long strong hoary hairs at anterior end, and which project over base of cephalothorax; sides and inferior surface thickly furnished with strong tawny hairs.

Hab.—Manly.

EXPLANATION OF PLATE.

PLATE III.

Fig. 1.—*Epëira diversicolor.*
1*a.*—Profile view of spider.
1*b.*—Epigyne.

Fig. 2.—*Epëira pulchra*, ♀
2*a.*—Epigyne.
2*b.*—Eyes.

Fig. 3.—*Epëira pulchra*, ♂
3*a.*—Maxillary palpus of ♂ as seen from above.

Fig. 4.—*Epëira rubripunctata.*

Fig. 5.—*Anepsia crinita.*
5*a.*—Eyes.

Fig. 6.—*Epëira sinuosus.*

Fig. 7.—*E. hamiltoni.*
7*a.*—Epigyne.

STUDIES IN AUSTRALIAN ENTOMOLOGY.

No. VI.—DESCRIPTION OF A NEW TIGER BEETLE FROM QUEENSLAND.

By Thomas G. Sloane.

Megacephala frenchi, n.sp.

Robust, oval, cylindrical. Metallic green, with a bluish tinge in some lights; antennæ, labrum, mentum, prosternum, mesosternum, metasternum, ventral segments (excepting lateral parts of three basal ones), legs and inflexed part of elytra black; palpi yellowish-brown. Head large, convex, smooth; eyes prominent, convex. Prothorax hardly broader than long (5 × 5¼ mm.), convex, smooth; disc a little depressed in front; anterior margin sinuate; base sinuate—the middle roundly produced backwards—bordered on each side near basal angles, these rounded off; median line strongly impressed between anterior and posterior transverse line; anterior transverse line sinuate, not extending to margins, strongly impressed on each side, weaker and subcircularly more remote from anterior margin in middle; posterior transverse line strongly impressed, almost straight, a little bent forward in middle, not extending to margins, ending in a shallow foveiform impression on each side. Elytra oval (11½ × 6½ mm.), roundly convex, widest rather behind middle; base truncate; shoulders rounded; apex widely and evenly rounded; basal part of elytra for a little less than half the length strongly punctate; the apical part smooth; the punctures of basal part forming eight rows on each elytron, these (excepting the sutural and marginal rows) rather irregular; two strong punctures a little behind the others along the line of the second row, three others, much smaller and but slightly perceptible, further towards apex along same line; the punctures of the marginal row finer and widely placed behind the punctate part, becoming towards apex merely fine points; border narrow not reflexed.

Length 19, breadth $6\frac{1}{2}$ mm.

Hab.—Cloncurry River, Queensland. Received from Mr. Charles French, Government Entomologist, Melbourne.*

This species is readily distinguished from *M. cylindrica*, Macl., (the only other species known to me), by the black colour of the legs, labrum and mandibles; the prothorax too is longer and more convex in the specimen before me than in the examples of *M. cylindrica* I have. I may remark that there is nothing in Count de Castlenau's description of the third known Australian species, *M. howitti*, excepting its smaller size, to suggest its being a different species from *M. cylindrica;* I do not think it will likely prove more than at most a variety of that species.

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* Since the above was written Mr. French has received, and sent to me, another specimen of *M. frenchi*, as coming from the north-west of Australia "between Roeburn and the Murchison River, about three hundred miles inland."—T. G. S.

ON THE LIFE-HISTORIES OF AUSTRALIAN COLEOPTERA.

PART I.

BY WALTER W. FROGGATT.

This paper is a brief record of observations made during the last season (1892) upon the larvæ, habits, and food plants of a number of Coleoptera, most of which are common in the vicinity of Sydney. I am not aware that anyone has worked at Australian beetles in regard to their larvæ and transformations in a systematic manner; the only paper on the subject I have seen is one by Mr. D. Best, of Melbourne, in which he describes forty-six Australian longicorns (but he only gives the food plants of a few and no descriptions of the larvæ), published in the Southern Science Record, Victoria, 1880-1, in five parts.

All the following species have been carefully bred from sections of infested stems cut from the trees, or from larvæ kept in damp earth.

I believe some interesting information in respect of the affinity of certain genera can be obtained by studying the larvæ of our longicorn beetles; and with a little experience it is not difficult to tell the genera to which some of the larvæ belong, as many of them have very distinctive characters.

The Acacias are attacked by a great number of fine longicorns, many of which do a great deal of damage to the young trees, while others do not appear to be partial to them until they are old and decaying; others again only infest dead limbs or dying trees. As in other orders of insects, the beetle larvæ are very much subject to the attacks of parasitic Hymenoptera, chiefly belonging to the family *Braconidæ*.

The genus *Phoracantha* comprises a number of large and handsome beetles which almost entirely confine their attacks to the Eucalypts, feeding upon the dead wood; several species are often found when cutting up blocks of firewood sold in Sydney, in which the larvæ must live for a considerable time.

I am indebted to the Rev. Thos. Blackburn for the identification of a number of the beetles described, to Mr. C. French for notes with regard to the habits of identical species in Victoria, and to Mr. R. T. Baker for naming the food plants of some of them.

MACROTOMA SERVILIS, Pascoe, Journ. of Ent. ii. 1863, p. 49.

Larva white, three inches long, slender, cylindrical, with broadish head; mouth parts ferruginous, jaws black, broad, forehead with slight furrow down centre, with shorter one on either side, the whole rugose; thoracic segments narrow, with fine crossed lines on the summit; legs small, ferruginous; first seven abdominal segments with an elongate square in centre of upper side, decreasing in length and increasing in width towards the extremity; eighth segment smooth, cylindrical, narrow, the last longest, smooth, shining, rounded at anus; on the under side the last two thoracic and first seven abdominal segments with somewhat similar but more elongate markings.

The larva feeds upon the stems of the large Banksias *(Banksia integrifolia)*, common along the New South Wales coast, mining large cavities out of both living and dead trees; the chambers are large but irregular in form, the grub when full grown forming a large oval chamber in which it undergoes its transformation.

Though an immense number of the Banksias about Sydney are riddled with the holes of these larvæ, yet the beetle is rarely found, as it generally hides in the crevices of the rough bark of the trunk. The larvæ from which my specimens were bred were taken in a section of a dead tree cut off on the "Nine Mile Beach," at Gerringong in August, the beetles coming out in December. The beetle is a reddish-chocolate-brown, the face rugose, furrowed between the eyes, and with a coat of short reddish hair below the junction with thorax; the thorax is covered with irregular confluent punctures, with irregular spines along the outer edges ; the elytra faintly furrowed with two shallow lines on the sides, and all covered with fine wavy lines which give it a rugose appearance, smaller and finer towards the apex ; femora and tibia armed with stout spines.

PHORACANTHA TRICUSPIS, Newman, Entomologist, 1841, p. 3.

Larva white, stout, with a broad head, small legs, segments regular, rounded at the anus ; mouth parts and jaws black, projecting ; head large, rounded, and arched over the jaws, square at apex, forehead with furrow in centre, rugose at apex, sloping down, hollow and smooth in middle and rugose below above mouth ; thoracic segments narrow, with an angular depression in the centre of each ; abdominal ones regular, first four narrow, fifth, sixth, and seventh rounder and broader, all with an impressed elongate square in the centre, eighth segment very narrow, smooth and shiny, anal segment large, smooth, shining, rounded at apex.

The larvæ attack the dead or dying timber of several of the Eucalypts, and after feeding under the bark in the earlier stages penetrate into the centre of the tree, gnawing out large flat chambers several inches in diameter ; in these they remain for several years.

The beetle is one of the largest of the genus, and is generally found hiding under loose bark on the stems of large trees.

URACANTHUS TRIANGULARIS, Hope, Trans. Zool. Soc. i. p. 108, t. 15, f. 4.

Larva bright canary yellow, long and slender, segments rounded, broad, and deeply constricted, lightly covered with reddish hairs, thickest on head and anal segment ; mouth parts ferruginous, jaws black, stout, and truncate ; head rounded in front, widest behind, darkest at base, smooth in centre, forehead creamy-white, with fine parallel striations ; legs ferruginous, very small ; thoracic and abdominal segments deeply impressed by a parallel line which divides each segment into two rounded warty lumps on the upper side, on the under side smooth, with slight corresponding marks on each segment; anal and segment preceding it smooth and cylindrical, covered with reddish hairs, the tip of the anal one ornamented with five stout spines, the first large, followed by two pairs of smaller ones.

The larva attacks the stems of *Eriostemon lanceolatus* just above the ground, feeding upwards and eating out the centre; at intervals of about an inch it gnaws a small hole through the bark, thus leaving a regular row of holes behind, which indicate its whereabouts; as it becomes full grown it crawls downwards, excavating several tunnels in the larger roots, pupating in the last of them. It also feeds on the stems of *Boronia pinnata* in a similar manner. Mr. C. French, of Melbourne, informs me that in Victoria the larva generally feeds upon the stems of the young saplings of *Banksia integrifolia*, but he has bred it also from stems of *Acacia longifolia* (var. *A. sophoræ)*, both growing on the coast.

With us the larvæ can be found in the Eriostemon bushes from May to December. I have taken them in all stages, as well as the perfect beetle, about June in the vicinity of Sydney. The beetle is not found at large until the early part of November, and is then invariably taken on the Leptospermum bushes. It is a very distinct species, the bright shining bare patch in the middle on either side of the elytra, the rest of which, together with the head, thorax, and legs, is densely covered with a creamy pubescence, gives it a very graceful appearance.

It has a wide range over N. S. Wales; I have seen specimens from Sydney, Newcastle, and Wilcannia; it is very variable in size and the pubescence often varies from pale creamy to reddish-brown.

Mr. Best says he has never seen any specimens from inland, and that it feeds on the common wattle *(Acacia decurrens ?)*.

PACHYDISSUS SERICUS, Newman, Ent. Mag. v. p. 494.

Larva dull white, stout, with broad head and small ferruginous legs; mouth parts and jaws black, head smooth and shining, with ferruginous band at base, the apex flat, finely striated; thoracic segments narrow, the last two and first six abdominal segments on their upper side ornamented with an irregular oval warty patch, widest and roundest on the apical ones; last segments smooth, anal segment overlapped by preceding one.

The larva has a preference for dead or dying bushes of *Acacia longifolia*, forming large parallel chambers, never of any great length, in the sap-wood of the larger stems.

I have never found the beetle on Acacias, though I have cut a number out of their stems; but I have taken it on the foliage of Kunzea, and hiding on the stems of Banksias at Rose Bay in January. It is a large handsome dark brown beetle, with the first two joints of the antennæ very stout and thickened, the thorax very much wrinkled, and the elytra and legs covered with a white silvery pubescence.

DISTICHOCERA MACULICOLLIS, Kirby, Trans. Linn. Soc. xii. p. 417, t. 23, f. 10.

Larva stout, thick, white, covered lightly with short hairs; mouth parts and jaws black, latter broad and stout, head broad and square, flat in front, lobed on either side by a line running down towards the mouth, base of head smooth and shining, the upper portion rugose, with a furrow in the centre of forehead; legs small, thoracic and abdominal segments with a deep elongate transverse depression in the centre of each segment, with corresponding ones on the under side; anal segment long, slender, smooth, shining, rounded at tip.

The larva attacks the stems of *Kunzea corifolia*, which it traverses in every direction; commencing under the bark, it gnaws irregular passages backwards and forwards, finally making several large parallel chambers towards the centre of the stem, in one of which it pupates.

The beetle is to be found, together with many others, feeding upon the honey in the flowers of the small scrub Angophora *(A. cordifolia)* in the end of December, but I have also taken them on the foliage of the food plant. The sexes are very unlike each other, the male black with white markings on the thorax and elytra, and large pectinate antennæ ; the female nearly twice the size has simple antennæ, head and thorax black blotched with deep orange-red, the elytra much broader, of a deep orange-red.

SYMPHYLETES NIGROVIRENS, Donovan, Epitom. Ins. N. Holl. 1805.

Larva white to semitransparent; with broad head and slender segments slightly covered with short hairs ; mouth parts and jaws black, head angular, widest at apex, smooth and shining, with an irregular patch of shallow punctures in centre ; legs wanting ; thoracic and abdominal segments narrow, of uniform thickness, shining on top, all the segments except the first thoracic and the last two abdominal ones with a transverse elongate oval rugose patch in the centre on the upper side, on the under side the first thoracic and the following segments with a double curved patch in their centre.

The larva attacks the upper branches of *Acacia juniperina*, in its earlier stages hollowing out the small twigs, but afterwards feeding down into the main stems, it cuts them clean off under cover of the bark, when they tumble off; it plugs the hole in the stem below with wood débris, and feeds downwards in a regular straight chamber, at the bottom of which it pupates. It also feeds in a similar manner upon the twigs of *Acacia longifolia*, pupating at the extreme tip of the broken stem.

The beetle is found in December and January feeding upon the bark of the young shoots of *Acacia longifolia.*

This is one of the smallest of the genus, its white face, legs, and broad stripe of white on either edge of the elytron forming a striking contrast to the deep green elytra and heart-shaped buff patch between the shoulders. It is found in N. S. Wales and Queensland. Best says that in Victoria it feeds upon the Black Wattle.

SYMPHYLETES ALBOCINCTUS, Guérin, Voy. Coquille, 1830, p. 137, t. 7, f. 7.

Larva dull white, long and slender, with regular rounded segments ; mouth parts ferruginous, jaws black, large and stout, head broad, smooth and shining, a transverse line near forehead with a patch of small punctures in centre; thoracic and abdominal segments of uniform size, deeply divided, rounded, with an elongate-oval depression, rugose on the inner edges in the centre of each, with corresponding markings on the under side, last segment smooth and cylindrical, overlapping the anal tip.

The larva feeds upon the soft woody stems of *Viminaria denudata*, eating the centre out of the small branches, and pupating in the tips. I have also bred it from the small twigs of *Acacia longifolia.*

The beetle feeds upon the young shoots of *Viminaria denudata*, and girdles or ring-barks the branch by gnawing several broad irregular bands round it, laying its eggs, one at a time, in small holes gnawed in the bark above the girdles, and generally depositing three or four in each branch. It is somewhat about the same size as *S. nigrovirens*, with a similar broad white stripe on either side of the elytra, but the back is of a uniform reddish-brown, marbled with irregular wavy buff markings. Found in N. S. Wales and Queensland.

SYMPHYLETES NEGLECTUS, Pascoe, Trans. Ent. Soc. 1863, p. 534.

Larva dirty white, slender, with rounded regular segments; mouth parts ferruginous, jaws black, head broad, angular, smooth and shining, with a few shallow scattered punctures across the centre, a short parallel line on either side, causing the centre of head to appear square; second and third thoracic, and all the abdominal segments except the last two, marked on the upper side with a wrinkled elongate-oval patch in the centre, with corresponding but more slender marks on the under side, last abdominal segment almost covering the anal extremity.

The larva feeds upon the stems of *Acacia longifolia*, eating out the wood in irregular tunnels, and pupating in the end of the last one.

The beetle is plentiful in December about Botany and Rose Bay; it girdles or ring-barks each branch with three or four deep rings right through the bark, then crawls up and gnaws several circular little flaps of bark in a horse-shoe shape without detaching them, depositing an egg under each; eggs oval, horn-coloured, and showing a regular network structure under a lens. If the beetle, which also feeds on the decaying bark, can find a dying broken branch, it dispenses with the girdling process and lays its eggs at once.

The beetles are plentiful, but from their uniform grey colour, and their habit of closely clinging to the twigs, they easily escape detection. They are dull brown, but so thickly covered with short grey hairs that it is only old rubbed specimens that show the ground colour; on either side of the elytra just below the shoulder is a well-defined crescent-shaped mark, by which this species is easily identified.

PIESARTHRIUS MARGINELLUS, Hope, Proc. Zool. Soc. 1840, p. 35.

Larva dirty white, segments long and slender, with short ferruginous legs, and rounded at apex; mouth parts with an irregular band-ferruginous above, jaws black, rounded at forehead, above flattened and shining; a furrow running down the centre of segments from behind the forehead to anal segment, each segment broadly divided from the preceding by a narrow band formed by the constricted apex of the segment, anal segment rounded at tip, covered with a few scattered hairs.

The larva feeds upon the stems of *Acacia longifolia*, in its earlier stages eating the centre out of the smaller twigs, it comes downward, gnawing all the wood off just under the bark on the top of the main limb, which then falls off; the larva now gnaws straight down the centre of the stem, filling up the opening at the top with wood débris. Hundreds of branches and young saplings are cut off every year at Rose Bay, the beetle coming out in the middle of December. I have also bred it from a branch of *Acacia decurrens*, received from Mr. J. H. Maiden. Mr. French informs me that it is a common beetle in Victoria on this Acacia.

I have never taken it at large, though I have bred a large number from infested twigs. The beautiful feathered antennæ of the male, with the dull reddish-brown longitudinal stripes on the creamy-white elytra, make this a very showy beetle; the female is much larger, with simple antennæ.

Best gives a long account of this beetle, with a general description of the larva and of its mode of attacking the stems of *Acacia mollissima* in a way somewhat different from that which obtains here. He mentions the rarity of this beetle in the early collections, and states that the reason it is so seldom found is that it climbs up into the topmost branches of the tree as soon as it comes out, and clings so tightly to the twigs that it is impossible to shake it down.

HEBECERUS CROCOGASTER, Boisduval, Voy. Astrolabe, II. p. 492, 18.

Larva semitransparent, brownish, with broad head and slender segments fringed with short hairs on the margins; mouth parts pale yellow, jaws large, ferruginous, black at tips; head large, rounded in front, square behind, smooth and shining on forehead, a parallel furrow from behind the head to the base of the ninth segment; the last two segments smooth, cylindrical, with anal tip small and rounded.

The larva lives upon the dead wood of *Acacia falcata*, eating away the sapwood just below the bark in irregular furrows, only forming a small oval chamber below the bark in the sapwood in which to undergo its transformation. My specimens were bred in November from infested stems collected at St. Mary's, N.S.W., in July.

This little longicorn is a dark chocolate colour, closely covered with fine hairs, the face, legs, and under side clothed with short grey hairs, the basal half or each joint of the antennæ whitish-grey, the apical half covered with much longer close black hairs, the thorax clothed with grey; the elytra deeply and closely punctured, covered with little patches of yellowish-brown hairs, with a lighter coat of scattered longer black hairs. It lives and breeds on the Black Wattle in Victoria, according to Mr. Best.

EUPŒCILA AUSTRALASIÆ, Donovan, Epitom. Ins. N. Holl. 1805.

Larva white, with the anal segments blackish from the earthy matter contained in the intestines showing through, legs stout, showing the tarsal joints, covered with short reddish hairs; mouth parts ferruginous, jaws black, large, and pointed; antennæ long, five-jointed; head dull yellow, smooth and shining; first thoracic segment small, others uniform with the abdominal ones, on the upper side each is divided into three distinct ridges, each with a transverse row of reddish hairs, last two segments not furrowed, smooth and shining, covered with fine short spines or short hairs as well as the longer scattered ones, last segment rounded.

The larva lives in rotten wood, either the débris in a decaying tree or in similar matter in a cleft. The specimens bred were taken out of a cavity between the limbs of a Eucalypt at St. Mary's, N.S.W., last July; and three months later when examined were all enclosed in hard oval earthen cocoons covered over with dirt and excreta.

This is one of our commonest Cetonias, and is very plentiful in the neighbourhood of Sydney towards the end of December, when numbers of them can be taken on the flowers of the stunted Angophora (*A. cordifolia*). The pale yellowish-green markings on the deep chocolate-coloured body, which is almost black at the head and apical portion of the elytra, give this beetle a very showy appearance.

STIGMODERA RUFIPENNIS, Kirby, Trans. Linn. Soc. xii. p. 456.

Larva slender, pale yellow, with small head and regular segments; mouth parts pale ferruginous, jaws black, very small; head long, triangular in front, raised in the centre, with two parallel ferruginous lines coming from the apex and converging into a point on forehead, on the under side of head a single straight line; thoracic and abdominal segments regular, slender and tapering to the anal one, which is slightly pointed.

The larva feeds upon the stems of *Acacia juniperina*, hollowing out the whole of the wood of the slender stems of this scrubby bush.

The specimens bred were obtained from bushes growing on the ranges near Bendigo, Victoria: it is also a common Sydney species; I took several last December on the Angophora flowers at Mossman's Bay.

This is an easily recognised species, with its steely blue head and thorax, and bright red elytra.

RHINOTIA HÆMOPTERA, Kirby, Trans. Linn. Soc. xii. p. 427, t. 22, f. 7.

Larva dull white, short, rounded, with large head, segments narrow fringed with fine reddish hairs ; mouth parts ferruginous, jaws black, small, at the tip of a smooth shining lobe, face above smooth, shining, the upper portion projecting and forming an over-arching ridge, which is finely striated; first and second thoracic segments broadest, abdominal segments of uniform size, divided from each other by a fold at the apex of each preceding one, which forms a triangular patch on either side, anal segment broad, truncate, and shining.

The chief food plant of the larva is *Acacia suaveolens,* but I have also bred it out of *A. pubescens* and *A. discolor.* The eggs are laid on the under side of the limb, where a small patch of bark has been gnawed off by the beetle, a minute hole showing where the larva has entered ; as it grows it hollows out the whole of the stem, pupating in the upper end. At Rose Bay in May nearly every bush of this Acacia contained one or more of the beetles or their larvæ.

The beetle is a common one about Sydney, feeding chiefly on the foliage of *Acacia discolor*, early in November. Its black head and thorax, with deep brick-red elytra divided down the centre with a narrow black stripe, and its elongated body easily distinguish it from any other of the weevils.

CHRYSOLOPHUS SPECTABILIS, Donovan, Epitom. Ins. N. Holl. 1805.

Larva white, with shining ferruginous head, stout black jaws, and rounded obese much wrinkled body; above the head slightly tinged with a ferruginous band; thoracic and abdominal segments very much corrugated with many fine transverse furrows, so that seen from above the divisions of the segments are very indistinct.

broadest about the middle, rounded at anus, a faint parallel furrow down the centre of the back; a few scattered hairs on sides.

The larva attacks the stems of *Acacia discolor.* The beetle lays the eggs singly on the stem after gnawing up a bit of bark, under which the egg is placed; sometimes a score of these roughened patches may be counted on a single tree all close together. The larva feeds downwards, forming large cylindrical chambers into the roots, which it completely hollows out, packing the gnawed wood so close behind it that it is difficult to detect it. I have also bred it from the roots of *Acacia suaveolens*, *A. linearis*, and *A. laurifolia.*

This was originally described as the "Botany Bay Diamond Beetle," and though one of our commonest Sydney beetles it is also one of the most beautiful; its large size and brilliant black head and body thickly covered with patches of bright green scales make it one of the most striking objects among our insects. It is found on nearly a dozen different species of Acacias, among them *A. discolor*, *A. longifolia*, *A. dealbata*, *A. decurrens*, and *A. suaveolens.*

PAROPSIS VARIOLOSA, Marsham, Trans. Linn. Soc. ix. 1808, p. 285, t. 24, f. 1.

Larva yellow and black, stout, short, with well-developed legs terminating with a claw; mouth parts, jaws, and head black, head and first thoracic segment furrowed in centre; legs black; first thoracic segment black, with orange-yellow markings at apex, second and third with first abdominal segments orange-yellow in centre, clouded on the sides with black, with a transverse band of black warty rounded excrescences in the middle of each, separated by large blotches of yellow; the last two and anal segment black, with yellow patch on either side.

The larva is a very active creature, crawling about on the leaves of *Eucalyptus corymbosa* upon which it feeds, attacking the leaf from the outer edge and eating it up to the midrib. The larvæ feed singly and do not cluster together like those of other species; when full grown they fall to the ground, burying themselves in the earth or rubbish, sometimes several inches beneath the surface, at others having the last few segments of the abdomen above the ground; these stand out and are jerked about rapidly if anything touches them; in a week or ten days the pupa turns into the perfect beetle and ascends the tree again.

This is one of the large leaf Paropses; the thorax and elytra are shining, reddish-brown, with irregular spots of pale yellow scattered all over, and very deeply punctured.

PAROPSIS RETICULATA, Marsham, Trans. Linn. Soc. ix. p. 285, t. 24, f. 2.

Larva short, stout, pale yellow, with black markings on upper side, legs long, robust; head and first thoracic segment black, the latter with narrow yellow margin on sides, second and third thoracic segments and legs yellow, the first six abdominal ones yellow with broad stripe of black on the sides, seventh and eighth yellow with rounded black patch in centre, anal segment black; a broad parallel clouded black band containing four small black tubercles on each segment traverses the centre of the back; under side pale yellow.

The larvæ feed upon the leaves of several species of Eucalypts, gnawing them in a similar manner to the previous species, but they cluster together much more when feeding; they undergo their metamorphoses in the ground. The eggs are laid in a ring consisting of several rows round a slender twig; they are long, oval, enclosed in an outer brownish-yellow ribbed shell, surmounted at each corner with a little curved horn.

This beetle is the commonest *Paropsis* about Sydney; the thorax is pale yellow with a marbled pattern, the elytra palish yellow, turning to reddish when dead, very finely and closely reticulated.

CALOMELA BARTONI, Baly, Trans. Ent. Soc. Lond. 1856, p. 245.

Larva with the head, thorax, and legs black, with pale green abdomen; mouth parts and jaws black; legs stout; thorax narrow; the abdomen larger, rounded, almost globular.

The larva feeds upon the foliage of *Acacia decurrens*, and is often very plentiful, but difficult to see on account of its protective colouration. The specimens bred were obtained in the Maitland district, but the insect has a very wide range over N. S. Wales and Victoria.

The beetle is always found on this Acacia; the head, thorax, and elytra are dark orange-yellow, deeply punctured; a broad parallel stripe of rich metallic green on either side. All the members of this genus, as far as I know, are found on this or other closely allied species of Acacia.

EPISCAPHULA PICTIPENNIS, Crotch, Cist. Ent. xiii. 1876, Revis. p. 35.

Larva pale yellow with black markings on the upper portion of segments, legs long, terminating in a sharp tarsal claw; mouth parts ferruginous, jaws small, head dull yellow, smooth, shining, with four or five black dots above the antennæ, rounded in front, square at apex; thoracic and abdominal segments dull yellow, the centre of each covered with a transverse elongate square blackish-brown patch covering nearly the whole of segment, a parallel dull yellow band interrupting them down the centre, broadest and lightest behind the head, blending with the brown towards the apex, anal segment surmounted by two small black spines; all the under side pale yellow. Pupa pale yellow with black eyes, and the portion of back black in larva replaced with patches of small black spines.

The larva feeds upon a small soft fungus growing on fences, in which it also undergoes its transformations; it is common in the neighbourhood of Sydney.

The beetle has the antennæ and head black, with a broad reddish-yellow bar between the eyes; thorax reddish-brown, darkest on the margins, with an irregular dark brown oval patch on either side; elytra deep brown with fine parallel striæ carrying fine punctures, an irregular star-shaped creamy-white patch on either shoulder; a crescent-shaped patch, creamy-white, about two-thirds down, and forming two large oval patches at the apex of thorax, containing a bright reddish oval spot in centre of each; under side of thorax and last two segments of abdomen reddish-yellow, the rest and the legs testaceous.

One of the commonest of the large fungus beetles found about Sydney.

AULACOCYCLUS KAUPI, Macleay, Trans. Ent. Soc. N.S.W. Vol. ii. p. 173.

Larva white, long, slender, with small brown head and very long slender legs terminating in a long slender sickle-shaped tarsal claw; mouth parts ferruginous; antennæ stout, two-jointed; jaws small, black; head broadest between the antennæ, narrow behind, impressed on either side with a triangular dint, and a slight furrow in centre; first thoracic segment broad, rounded in front, with deep dint on either side joined by a transverse furrow in centre, the following segments broad, with a narrow rounded fold in front, the hind portion raised slightly, swelling out, a faint parallel furrow down the centre, anal segment ending in a round fold, anus in centre forming a triangular opening; under side regular, crenulated, and all the segments covered with scattered long hairs.

The larvæ are found under large rotten logs, upon which they feed, crawling about with their bodies arched slightly; they form large cylindrical oval smooth brown cocoons of earthy fragments, and can be found together in all stages in January.

This Passalid is a common species of medium size, black, smooth and shining, the thorax ornamented with a small curved horn, blunt and cleft in the centre, the elytra broadly and deeply furrowed with fine punctures in the striæ.

LAGRIA GRANDIS, Gyll. Schonh, Syn. Ins. 1, 3, App. p. 9.

Larva black, shining, covered with short reddish hairs; head small, antennæ short, jointed, standing out straight on either side, ferruginous; legs stout, with tarsal claw; segments regular, rounded, smooth and shining, rounded towards the tip of abdomen, where the last segment is produced into two conical pointed spines.

The larva lives under damp logs, moving about very quickly when disturbed, and casting its skin very frequently ; after moulting it is quite white, but soon regains its natural colour.

The beetle is found on the foliage of young Eucalypts ; it is the common Lagria about Sydney ; it is light reddish-brown, very closely covered with fine confluent punctures and a scattered growth of short brown hairs.

NOTES AND EXHIBITS.

Mr. Brazier read the following Note on *Cassis Wyvillei*, Watson, from the Solomon Islands :—

Cassis (Bezoardica) Wyvillei, Watson, Zoology of H.M.S. "Challenger," Vol. xv. p. 408, pl. XIV. fig. 13, 1886.

Hab.—Station 204A, November 2, 1874, lat. 12° 43′ S., long. 122° 9′ E., Philippine Islands, 100 to 115 fathoms, green mud ; two specimens found.

While at Makeira Harbour, San Christoval, Solomon Islands, July 26, 1872, I obtained by barter a fine large specimen of this species from a native who wore it round his neck, having made two small holes in it at the upper and lower parts of the outer lip ; in pigeon English he gave me to understand that he had picked up the shell four months previously after a heavy gale. It is about one of the thinnest forms of *Cassis* known. It is just as well to put this locality on record ; the specimen is now in the collection of Dr. J. C. Cox, of Sydney.

Mr. Brazier also exhibited a specimen of *Astele subcarinatus*, Swainson (1854), identical with *Eutrochus perspectivus*, A. Adams (1863); and he pointed out that the former name had been omitted by all Conchological monographers of the family TROCHIDÆ, and that the specific name *Adamsi*, given by Mr. Pilsbry to Adams' species, will not hold good. Swainson's type came from the east coast of Tasmania ; the specimen exhibited from Circular Head, Tasmania.

Mr. W. S. Duncan sent for exhibition an interesting collection of Coleoptera from Inverell, N.S.W., comprising specimens of both common Sydney insects and of Southern Queensland forms, as well as of cosmopolitan species and of a few others which will probably prove to be undescribed.

Dr. Cox exhibited specimens of *Dendrobium speciosum* showing the peculiar mode of budding which at times obtains in this species.

Professor David contributed the following "Note on the occurrence of the mineral sphene (titanite) in the granite from the water-works tunnel, Bathurst":—

In the last edition of his work on the Minerals of New South Wales, p. 85, Professor Liversidge, F.R.S., refers as follows to the occurrence of a single isolated specimen of the above mineral: "Sphene. A calcium silico-titanite. Crystallises in oblique system. I have met with but one well-crystallised specimen, of a green colour; the locality in New South Wales from which it came is uncertain." The Rev. J. Milne Curran, F.G.S., in his paper on the Geology and Petrography of Bathurst [P.L.S.N.S.W. Vol. vi. (2nd ser.)] has mentioned the occurrence of sphene in granite at Mt. Stewart, near Bathurst.

The author about two years ago collected some specimens of granite from the tunnel driven partly under the bed of the Macquarie River from the bottom of the well-shaft at the Bathurst water-works. On examining one of these specimens lately, at the Laboratory of the Geological Department at the University of Sydney, the author has observed that it contains well-formed crystals of sphene in tolerable abundance.

The crystals of sphene in this granite are of a brown colour seen by reflected light, and by transmitted light are of a honey-yellow to reddish-yellow colour. In shape under the microscope the sections of the crystals appear as acute-angled rhombs or prisms, terminating in sharp ends. Each crystal is surrounded by a dark zone, as seen under the microscope by transmitted light, due to its high index of refraction, and the surfaces of the sections have a somewhat rough pitted appearance. The pleochroism is not very strongly marked, and the mineral does not polarise in bright colours, but remains of a somewhat greyish tint under crossed nicols. Near the centre of one large crystal there are abundant enclosures of an opaque black mineral, which is probably titaniferous iron. The cleavage is somewhat strongly marked. The mineral dissolves slowly in sulphuric acid.

It appears to have been one of the earliest minerals in the granite to separate out, as most of the other minerals are moulded on to the sphene crystals and have not interfered with their growth.

The granite in which the sphene crystals occur contains a large amount of hornblende as well as mica.

Mr. Fletcher showed an interesting specimen of the "Flannel flower" (*Actinotus helianthi*, Labill.), forwarded for exhibition by Dr. Woolls about a fortnight ago, a few days before his death, with the following note: "In the ordinary form the involucre consists of about ten tomentose bracts enclosing a dense head of umbels; but in the accompanying specimen eight heads of flowers, each on pedicels about an inch long and surrounded by about six bracts, have grown out of the common involucre."

Also five individual flowers of *Rhyncospermum jasminoides*, Lindl., an Apocynaceous plant from China not uncommon in Sydney gardens, each of which had proved a veritable death-trap to a large indigenous flower-frequenting fly (fam. *Tabanidæ ?)*, which in attempting to rifle the flower of its nectar had become inextricably caught by the proboscis. The specimens—only a portion of those noticed—were forwarded by Mr. W. N. Dove, B.A.

Mr. Maiden showed a specimen of the new species of *Acacia* from the Goulburn District, allied to *A. pubescens*, described in the paper by Baron von Mueller and himself.

Mr. Froggatt exhibited the beetles mentioned in his paper; together with living specimens of the larvæ, cocoons, and perfect beetles of a common Passalid (*Aulacocyclus Kaupi*, Mcl.) from near Bathurst. Also a series of specimens of the female galls of *Brachyscelis duplex*, Schrader, in various stages of growth, on *Eucalyptus capitellata* from Sutherland.

Mr. L. Stephenson exhibited specimens of an Orchid, *Drakæa Huntiana*, F.v.M., recently found by him on the Blue Mts., near Blackheath, the species having been found previously only on Mount Tingiringi, on the southern border of the colony, at an elevation of about 5000 feet.

WEDNESDAY, APRIL 26TH, 1893.

Mr. E. R. Waite, F.L.S., and Mr. J. A. Watts, M.A., were introduced as visitors.

Mr. George R. Horan, Kentucky, G.N. Railway, N.S.W., and Dr. John H. Thomson, C.M.Z.S., New Bedford, Mass., U.S.A., were elected Members of the Society.

The President announced that at an early date it would become necessary to close the list of subscribers to the Macleay Memorial Volume. Gentlemen desirous of becoming enrolled as subscribers were therefore reminded that it was desirable that their names should be sent in on or before May 15th next.

DONATIONS.

"Société Géologique de Belgique—Annales." T. xviii. 3^e Liv.; T. xix. 4^e Liv. (1891-92). *From the Society.*

"Archives Néerlandaises des Sciences Exactes et Naturelles." T. xxvi. 4^{me} et 5^{me} Livs. (1893). *From the Society.*

"Royal Society of Queensland—Proceedings." Vol. viii. Parts 2-4 (1890-92). *From the Society.*

"Royal Society of London—Proceedings." Vol. li. No. 314; Vol. lii. Nos. 315-318. *From the Society.*

"Linnean Society of London—Proceedings for Sessions 1871-72, 1872-73, 1873-74." *From the Society.*

"Zoological Society of London—Abstract of Proceedings," February 14th and 28th, 1893. *From the Society.*

"Zoologischer Anzeiger." xvi. Jahrg. Nos. 413-414 (February-March, 1893). *From the Editor.*

"Société d'Horticulture du Doubs, Besançon — Bulletin." Nouvelle Série, No. 26 (February, 1893). *From the Society.*

"Perak Government Gazette." Vol. v. (Index); Vol. vi. Nos. 6-7 (March, 1893). *From the Government Secretary.*

"Pharmaceutical Journal of Australasia." Vol. vi. (1893), No. 3. *From the Editor.*

Two pamphlets entitled—(1) "Pearls: their Origin and Formation"; (2) "Aborigines of Western Australia." By A. F. Calvert. *From the Author.*

"Johns Hopkins University Circulars." Vol. xii. No. 103 (February, 1893). *From the University.*

"Geological Survey of Queensland—Second Report on the Normanby Gold-Field." By R. L. Jack (1893); "Geological Observations in British New Guinea in 1891." By A. G. Maitland. *From the Government Geologist.*

"Société Royale Linnéenne de Bruxelles—Bulletin." xvii^{me} Année, Nos. 1-4 (October, 1892, to January, 1893). *From the Society.*

"Victorian Naturalist" Vol. ix. No. 12 (April, 1893). *From the Field Naturalists' Club of Victoria.*

"Société Zoologique de France—Bulletin." T. xvii. No. 8 (1892). *From the Society.*

"Archiv für Naturgeschichte." lix. Jahrg. i. Bd. 1 Heft (1893). *From the Editor.*

"Agricultural Gazette of N.S.W." Vol. iv. No. 3 (March, 1893). *From the Director of Agriculture.*

"Académie Royale des Sciences et des Lettres de Danemark, Copenhague—Bulletin pour 1892." No. 2. *From the Academy.*

"Société Impériale des Naturalistes de Moscou—Bulletin." Année 1892, No. 3. *From the Society.*

"Naturhistorisches Museum in Hamburg—Mitteilungen." ix. Jahrg., Erste Hälfte (1891). *From the Museum.*

"Société Linnéenne de Normandie—Mémoires." xvii^{e} Vol. 1er Fasc. (1892). *From the Society.*

"Geological Survey of Canada — Contributions to Canadian Palæontology." Vol i. Part 4. By J. F. Whiteaves (1892). *From the Director.*

"American Naturalist." Vol. xxvii. No. 315 (March, 1893). *From the Editor.*

"Australasian Journal of Pharmacy." Vol. viii. No. 88 (April, 1893). *From the Editor.*

"Museum of Comparative Zoology at Harvard College — Bulletin." Vol. xvi. No. 11 (January, 1893); Vol. xxiii. No. 6 (January, 1893); Vol. xxiv. Nos. 1-2 (January, 1893). *From the Curator.*

"American Museum of Natural History—Bulletin." Vol. v. Sheet 2 (1893). *From the Museum.*

"Canadian Record of Science." Vol. v. No. 4 (1892). *From the Natural History Society, Montreal.*

"Handbook of the Flora of New South Wales." By Charles Moore, F.L.S., &c., and Ernst Betche. *From the Principal Under-Secretary, Sydney.*

PAPERS READ.

NOTE ON THE OCCURRENCE OF THE SANDERLING *(CALIDRIS ARENARIA)* IN BORNEO.

By Henry Seebohm.

(Communicated by Dr. E. P. Ramsay.)

In the last number of the Records of the Australian Museum (ii., p. 22) sundry errors respecting the Sanderling are published, which ought not to be allowed to remain uncorrected. First, the existence of two races of the Sanderling is assumed. To the best of my knowledge this is a pure myth, which has never been supported by a shred of evidence and is opposed to all known facts bearing upon the case. The only authority for the myth that I know of is the bare statement that examples of this species from the New World seem to be constantly larger than those from the Old (Newton, Ibis, 1859, p. 256). This is quite contrary to my experience. Twelve examples in my collection from the New World vary in length of wing from 4·7 to 5·05 and average 4·84 inches, whilst 27 examples from the Old World also vary from 4·7 to 5·05 and average 4·81 inches. Secondly, the assertion that Java seems to be the only island of the Malay Archipelago in which the presence of the Sanderling has been determined ceased to be true in 1881, when Mr. Pretyman procured an example on the Tampussuk River, in North-west Borneo. The occurrence of the Sanderling in Borneo is also confirmed by a second example procured on Baram Point (Everett, Ibis, 1890, p. 465). Both these examples are in the British Museum. Thirdly, the ignorance of the writer of any instance of the Sanderling having been observed within the tropics to the eastward of Java cannot explain away the fact that it has occurred on the Marshall Islands (Finsch, Ibis, 1880, p. 331). Finally, in justice to Temminck, it ought to be mentioned that in the list of the Waders in the Leyden Museum published in 1864, besides an example obtained by Kuhl on Java about 1826, there are also two other examples from that island dated 1862 (Schlegel, Mus. Pays-Bas, Scolopaces, p. 57).

London, 12th July, 1892.

NOTE ON BACTERIAL DISEASES OF THE ROOTS OF THE *LEGUMINOSÆ.*

By Thos. L. Bancroft, M.B., Edin.

(Communicated by J. H. Maiden, F.L.S.)

(Plate iv.)

Whilst transplanting some sensitive plants (*Mimosa pudica*, Linn.), my attention was attracted to the peculiar tuber-like bodies on their roots, which were distinct from the tubercles caused by worms *(Tylenchus)*.

When broken across these bodies were noticed to possess a juice having a remarkable smell; microscopic examination showed this fluid to be teeming with bacteria, all in a state of violent agitation. Cover-glasses were smeared with it, passed through the flame and stained in methyl-blue; examined both in the wet state and after clarifying and mounting in balsam, the bacteria were seen to be bacilli. Search was made for a similar disease in other plants, but only specimens of the *Leguminosæ* were found affected, indeed every plant examined of that order had a bacterial disease. The tubercles on the roots exhibited great variety of shape, as did also the bacilli contained in them; some of the latter were very thin and long, others thick, some curved, many were motile, some immotile, whilst others exhibited Brownian movements; all apparently were referable to the genus *Bacillus*.

No Leguminous plant appears to be altogether free from a bacterial disease of the roots; some genera, however, are affected more than others. I have so far not noticed a similar disease on any other plant. A number of experiments were made to ascertain if plants could be grown free from these diseases, and with care it was found possible to do so.

I also artificially cultivated, on a broth made of beans and thickened to a jelly with agar-agar, some of these bacteria. I afterwards found that "Tubercular root-diseases of the Leguminosæ" was a subject upon which much attention had been bestowed in Europe, especially in Germany. Professor Marshall Ward of London has studied these diseases carefully for many years past, and has contributed much to the Transactions of the Royal Society upon the subject; he found that the more a plant was affected with the disease the better it grew; the bacteria help the plant to assimilate nitrogen and are a benefit to it.

Although this subject has been so ably worked up in Europe, I hope these notes will not be unacceptable to the Society, as no record, as far as I am aware, of root-diseases of bacterial origin has been made in Australia.

Brisbane, March, 1893.

EXPLANATION OF PLATE.

The roots of five leguminous plants affected with bacteria. Commencing in order from the top, the plants are *Mimosa*, *Sesbania*, *Desmodium*, *Medicago*, and *Crotalaria*.

(Reproduced from a life-size photograph.)

REVISION OF THE AUSTRALIAN *AMARYGMIDES.*

By the Rev. T. Blackburn, B.A., Corr. Mem.

Part II.

THE GENUS *CHALCOPTERUS* (continued).

Since I forwarded to the Linnean Society the first part of this memoir, *Amarygmides* have been pouring in to me in large numbers from many valued correspondents, who wished me to name their specimens, with the result that I have been obliged to add some new species of *Chalcopterus* to those already described, and to re-write my tabulation of the genus. I have also, through the great kindness of Mr. Masters, had the opportunity of inspecting the types of the two *Amarygmides (velutinus* and *viridicollis*—both *Chalcopteri)* described by Mr. W. S. Macleay, and through the generosity of Mr. Olliff have become possessed of specimens compared with the types of several of Sir W. Macleay's species, while Mr. Skuse has done me the favour of confirming (by comparison with the types) two of my determinations of Sir W. Macleay's species *(Chalcopterus grandis* and *Amarygmus striatus)*, and of writing descriptions for me of two of that learned author's species *(obsoletus* and *picipes)*, which were the only two remaining unknown to me.

In one respect I have considered it desirable to depart from the plan I laid down for myself at the outset and mentioned in the first part of this memoir by including in the tabulation the species whose identification with existing descriptions I regard as doubtful. On the whole I have thought it better to include these for the purpose of giving greater completeness to my "Revision." In doing so I must repeat what I said at the outset—that I have very little doubt my nomenclature will sooner or later undergo much correction. I am satisfied that under the circumstances (many of the existing descriptions being completely insufficient, and the types being scattered all over the world, and not a few of them having probably perished) it is *impossible for anyone* to identify all the previously described species with certainty. This being the case, the first step towards clearing up the hopeless confusion must be, I think, a general revision of the genus which shall enable students to identify the species to which the author of that revision attributes the names of other authors. When that is done there is something to work upon, and it will be easy for those in one place and another who have access to the types to correct the inevitable inaccuracies of this first revision. How far I have succeeded in my attempt to enable others to identify the insects to which I have applied the various names, and so to determine whether I am right or wrong, of course has yet to be put to the test. I offer my attempt to the Society with much diffidence, but not without hope that this first revision of the genus may lead to the possibility eventually of a re-revision, the accuracy of which will be much more reliable. It will be noticed that in the tabulation I have indicated the names that I have been able to connect with species only doubtfully by enclosing them in brackets. There are now only four existing names likely to be of *Chalcopteri* which I have been obliged to disregard altogether on the ground that I cannot connect them with any insect known to me and that the descriptions of them do not justify their assignment to a place in my tabulation, viz., *cupricollis*, Hope, *obtusus*, Pasc., *puncticollis*, Hope, *smaragdulus*, Fab. ; the rest of the described Australian *Amarygmides* are either to be found in the following tabulation, or in the list of probable synonyms (in Part I. of this memoir), or are probably true *Amarygmi*.

It is necessary to say a few words about the characters that have appeared to me most reliable and most easily observed as distinguishing the species of *Chalcopterus inter se.* I may remark that the tabulated statement of the specific characters which follows is the result of a good deal of study and not a few unsuccessful attempts to produce a satisfactory tabulation. As regards colour, I am afraid it is as nearly as possible useless for classificatory purposes. There is no species of which I have seen numerous specimens that I have not ascertained to be variable in respect of colour. Nevertheless, my observations certainly go to show that the absence of *all* colour from particular parts of the body is clearly specific. I know no species, *e.g.*, having the prothorax or undersurface generally of brilliant metallic colours, but occasionally varying by the absence of those colours, nor any *vice versa*—with the one exception that, as far as I have seen, I should judge most species to be liable to the loss of colour from the whole body—so as to be entirely black. I think, too, that the *direction* of the colouring on the elytra is very little variable, the different colours running in well defined longitudinal vittæ (*e.g.*) being a fairly reliable character. I have, however, made very little use of colour in characterising species.

The main difficulty, as usual in classification, I have found to be the selection of characters for the principal divisions, whatever character is selected appearing to be feebly defined yet not quite wanting in a few intermediate forms. After several abortive attempts to divide *Chalcopterus* into two main groups, I have found that the most workable character for the purpose is the presence or absence of a sulcus bordering the internal or antero-internal margin of the eye. Nearly all the species have either no sulcus at all or a very strongly defined one; nevertheless, there are a few in which there is a feeble indication only of this "ocular sulcus," and I have found it necessary in adopting this character as the main classificatory character of the genus to indicate by a special mark in the tabulation certain species (placed among those in which the ocular sulci are absent) in which a doubt might be possible.

The form of the prothorax is very different in different species and appears to be quite constant, so that I have been able to use it with great confidence in tabulating the distinctions of the species, and a similar satisfactory result is attained by noting the colour of the vestiture of the underside of the tarsi and the width of the interval between the eyes. This latter character might be regarded with natural suspicion as likely to be only sexual, but I do not find that to be the case. In the instance of the few species in which I have been able to make sure of the sexes by the dissection of the internal organs, I have found that the eyes of the male are as widely separated from each other as those of the female.

The external sexual distinctions appear to be very slight. The male is usually somewhat smaller and narrower than the female, and his antennæ and tarsi are usually a little longer and more slender.

A. Eyes not (or scarcely) bordered by a sulcus.

B. Legs entirely of dark colour.

C. Underside not metallic-iridescent.

D. Tarsal vestiture black or nearly so.

E. Prothorax of normal form and sculpture (*i.e.*, not as EE, EEE, &c.).

F. Elytra not (or scarcely) striate.

G. Seriate puncturation of elytra entire.

H. Size moderate or small (under 8 lines).

I. Head punctulate between the eyes.

J. Interstices of elytra distinctly and more or less closely punctulate.

K. Punctures in lateral series of elytra close [at least 4 punctures (in 7th entire series) in a length equal to the width of the interstice between the 7th and 8th series].

L. A conspicuous nitid lævigate space on the middle line of the face.

M. Width of the interval between the eyes not (or scarcely) less than the length of the third joint of the antennæ.

N. Punctures on prothorax faintly impressed but not very fine.

O. Front piece of clypeus strongly concave behind.................... *clypealis*, Blackb.

OO. Front piece of clypeus of ordinary shape.

P. Elytra strongly gibbous behind base... *simius*, Blackb.

PP. Elytra much less strongly convex... *cupripennis*,* Germ., Blessig, Blackb., nec Hope.

NN. Punctures on prothorax less feeble and very fine........ *versicolor*, Blackb.

MM. Width of interval between eyes much less..................... *tinctus*, Blackb.

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* This species is no doubt *affinis*, Blessig (also *Howitti*, Pasc.), but is not *cupripennis*, Hope, as it has generally been called (*vide infra*, p. 70).

LL. Face evenly punctured or nearly so.

M. Punctures of elytral interstices extremely strong and coarse...... *rugosipennis*, Macl.

MM. Punctures of interstices much less strong and coarse (as fine as in *cupripennis*, Blackb.).

N. Prothorax fully twice as wide as long........... **exoletus*, Blackb.

NN. Prothorax less than twice as wide as long.................. **difficilis*, Blackb.

KK. Punctures in lateral series of elytra less close [less than 4 punctures (in 7th entire series) in a length equal to the width of the interstice between the 7th and 8th series] *variabilis*, Blessig.

JJ. Interstices of elytra lævigate or very finely and sparsely punctured (very much more so than in *cupripennis*, Blackb.).

K. Prothorax notably less than twice as wide as long.

L. Punctures in the elytral series sparse (sc. intervals between puncture and puncture generally much longer than diameter of individual punctures)................ **lætus*, Blackb.

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* These species have some traces of ocular sulci.

LL. Punctures in elytral series close (sc. intervals shorter than diameter of punctures).

M. Form convex ; elytral interstices distinctly though very finely and sparsely punctulate.... *juvenis*, Blackb.

MM. Form more depressed ; elytral interstices scarcely visibly punctured, even under a Coddington lens.................... *carus*, Blackb.

KK. Prothorax not or scarcely less than twice as wide as long.

L. Seriate punctures of elytra fine (not coarser than in *variabilis*, Blessig).

M. Basal joint of hind tarsi not noticeably shorter than joints 2-4 together (exclusive of the claws).

N. Seriate punctures of elytra faint, feeble, and close.............. *vigilans*, Blackb.

NN. Seriate punctures much better marked and less close... *proximus*, Blackb.

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* These species have some traces of ocular sulci.

MM. Basal joint of hind tarsi notably shorter.

N. Interval between eyes scarcely narrower than length of basal joint of antennæ...... *sparsus*, Blackb.

NN. Interval between eyes much narrower than length of basal joint of antennæ.......... *Cairnsi*, Blackb.

LL. Seriate punctures of elytra much coarser (more so than in *variabilis*, Blessig) .... *modestus*, Blackb.

II. Head not punctulate between the eyes...................... *bellus*, Blackb.

HH. Size large (long. 8 lines or more).

I. Basal joint of hind tarsi not (or scarcely) longer than apical joint.

J. Prothorax fully twice as wide as long....................... [*cupreus*, Fab.]

JJ. Prothorax evidently less transverse.................. *brevipes*, Blackb.

II. Basal joint of hind tarsi much longer than apical joint..... *grandis*, Macl.

GG. Seriate puncturation of elytra obliterated (or nearly so) close to front margin.

H. Width of interval between the eyes not greater than length of basal joint of antennæ.

I. Basal joint of hind tarsi fully as long as joints 2-4 together *placidus*, Blackb.

II. Basal joint of hind tarsi not so long........................ *Froggatti*, Blackb.

HH. Width of interval between the eyes notably greater than length of basal joint of antennæ...... .... *polychromus*, Pasc.

FF. Elytra very distinctly striate from base to apex.

G. Prothorax narrowed in a continuous curve from base to apex.

H. Form very narrow and parallel *interioris*, Blackb.

HH. Form oval, much wider....... *Mastersi*, Blackb.

GG. Sides of prothorax subparallel in their basal half............ *superbus*, Blackb.

EE. Base of prothorax not more than half again as wide as the front, front angles prominent and acute.

F. Width of interval between the eyes greater than length of basal joint of antennæ.

G. Interstices of elytra more or less convex.

H. Elytra very strongly striate... *suturalis*, Pasc.

HH. Elytra scarcely distinctly striate .... *purpureus*, Germ.

GG. Interstices of elytra quite flat *vividus*, Blackb.

FF. Width of interval between the eyes much less.................. *intermedius*, Blackb.

EEE. Prothorax very strongly transverse and with strong (laterally almost confluent) punctuation.

F. Interstitial and seriate punctures of elytra quite similar *inter se*.. *confluens*, Blackb.

FF. Seriate punctures of elytra very distinctly larger and stronger than the interstitial............ *fastuosus*, Germ.
obsoletus, Macl.

EEEE. Prothorax trapezoidal (*i.e.*, sides viewed from above almost rectilinear).

F. Front of prothorax not abruptly truncate, its puncturation feeble.

G. Interstices of elytra very distinctly punctulate.

H. Seriate punctures of elytra very conspicuous (sculpture almost as in *cupripennis*, Blackb.)........................ *eyrensis*, Blackb.

HH. Seriate punctures much less distinct (sculpture almost as in *fastuosus*)............ *micans*, Blackb.

GG. Interstices of elytra almost impunctate..................... *Palmerstoni*, Blackb.

FF. Front of prothorax abruptly truncate, its puncturation very strong...................... *perlongus*, Blackb.

EEEEE. Prothorax small, subgibbous, nitid, with extremely sparse puncturation........ *prospiciens*, Blackb.

DD. Tarsal vestiture ferruginous or fulvous.

E. Prothorax normal (*i.e.*, not as EE).

F. Width of prothorax across front less than $\frac{2}{3}$ of its width across the base.

G. Interval between the eyes not (or scarcely) wider than length of basal joint of antennæ (much narrower than in *cupripennis*, Blackb.).

H. Interval between the eyes not narrower than length of 2nd antennal joint.

I. Interstices flat throughout.

J. Interstices distinctly punctulate.

K. Interval between eyes about equal in width to length of basal joint of antennæ.

L. Seriate punctures of elytra moderate or fine.

M. Prothorax scarcely more than half again as wide as long.................... *obscurus*, Blackb.

MM. Prothorax much more than half again as wide as long.

N. Seriate punctures of elytra obsolete near apex.................... *velutinus*, W. S. Macl.

NN. Seriate punctures of elytra not enfeebled near apex............ *rusticus*, Blackb.

LL. Seriate punctures large foveæ as in *cylindricus* *nobilis*, Blackb.

KK. Interval between eyes distinctly narrower than length of basal joint of antennæ......... *neglectus*, Blackb.

JJ. Interstices not distinctly punctulate.

K. Prothorax black and more or less nitid.

L. Punctures in the elytral series close (much as in *variabilis*, Blessig)....... *minor*, Blackb.

LL. Punctures in the elytral series much less close and of oblong form..... *hunterensis*, Blackb.

KK. Prothorax bright blue.... *pulcher*, Blackb.

II. Interstices (at least in part) distinctly convex.

J. Prothorax very notably less nitid than the elytra.

K. Size very large (long. 8½ lines)...................... *major*, Blackb.

KK. Size much smaller (long 7 lines).................. *mercurius*, Blackb.

JJ. Prothorax not noticeably less nitid than the elytra *mimus*, Blackb.

HH. Eyes almost contiguous...... *ocularis*, Blackb.

GG. Interval between the eyes wider than length of basal joint of antennæ (not much narrower than in *cupripennis*, Blackb.).

H. Seriate punctures of elytra fine and close (more than 2 in a length equal to the width of the adjacent interstice).

I. Interstices flat and distinctly punctured.

J. Prothorax very evenly narrowed forward from its base....... .... *similis*, Blackb.

JJ. Prothorax not much narrowed forward in its basal half......................... **Leai*, Blackb.

II. Interstices convex and impunctulate.................... *longiusculus*, Blackb.

HH. Seriate punctures of elytra large foveæ (less than 2 in a length equal to the width of the adjacent interstice) *cylindricus*, Blackb.

FF. Width of prothorax in front fully $\frac{2}{3}$ of its width at the base *Bovilli*, Blackb.

EE. Prothorax nearly parallel-sided in the hinder half.

F. Prothorax not wider in the middle than at the base.

G. Prothorax evenly punctulate.

H. Interstices of elytra very finely punctured.

I. Prothorax extremely convex, closely punctured............. *colossus*, Blackb.

II. Prothorax much less convex, sparsely punctured.......... *palmerensis*, Blackb.

HH. Interstices of elytra exceptionally coarsely punctured *imperialis*, Blackb.

GG. Prothorax very unevenly punctulate (*i.e.*, large impunctulate spaces)........ .... *longulus*, Blackb.

FF. Prothorax notably wider at the middle than at the base. ...... *laticollis*, Blackb.

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* This species has faint traces of ocular sulci.

CC. Underside of metallic colour.

D. Tarsal vestiture black.

E. Interstices of elytra distinctly punctulate.

F. Form oval.......................... *fervens*, Germ.

FF. Form elongate-parallel........... *longipennis*, Hope.

EE. Interstices of elytra not punctulate.............................. *iridiventris*, Blackb.

DD. Tarsal vestiture fulvous.

E. Size large, form oval (moderately wide)................................ *setosus*, Blackb.

EE. Size small, form very narrow and parallel........ .... *gracilior*, Blackb.

BB. Femora red.............................. *amethystinus*, Fab.

AA. Eyes bordered within by a deep and more or less wide sulcus or fovea.

B. Legs entirely of dark colour.

C. Tarsal vestiture black or pitchy-black.

D. Width of interval between eyes equal (or nearly so) to length of basal joint of antennæ.

E. Species of small or moderate size—at most less than long. 8½ lines.

F. Species not having both prothorax and elytral interstices devoid of puncturation.

G. Seriate punctures of elytra quite well defined and conspicuous (at least in part).

H. Ocular sulci elongate, extending a good deal along the inner and front margins of the eyes.

I. Interstices flat or nearly so.
J. Form elongate-oval or more or less parallel.
K. Ocular sulci extremely strongly impressed.
L. Elytra variegated with stripes of different colours.
M. Seriate puncturation of elytra fine (very little less so than in *cupripennis*, Blackb.)........ [*resplendens*, Boisd.]
MM. Seriate puncturation of elytra much coarser .... *iridicolor*, Blessig.
LL. Elytral colours uniform (green or reddish-copper, according to the point of view).......... [*vinosus*, Pasc.]
KK. Ocular sulci much more feebly impressed.
L. Seriate puncturation of elytra entire.
M. Interstices of elytra impunctate and very nitid..................... *viridicollis*, W. S. Macl.
MM. Interstices of elytra not both impunctate and very nitid.
N. Prothorax opaque....... *opacicollis*, Macl.
NN. Prothorax nitid........ *eremita*, Blackb.
LL. Seriate puncturation of elytra very irregular, only here and there distinct.................. *semiseriatus*, Blackb.

JJ. Form obovate (wide about base of elytra and much narrowed hindward)...... *punctipennis*, Macl.

II. Interstices from base to apex decidedly convex........... *plutus*, Blackb.

HH. Ocular sulci foveiform, placed at the antero-internal angle of the eye.

I. Elytral interstices more or less strongly punctured (at least as strongly as in *cupripennis*, Blackb.).

J. Prothorax nitid................ *murrayensis*, Blackb.

JJ. Prothorax opaque........... *punctulatus*, Blackb.

II. Elytral interstices much more finely punctured............. *macer*, Blackb.

GG. Seriate punctures of elytra confused among those of the interstices (after the manner of *fastuosus*, Germ.).......... *oblongus*, Blackb.

FF. Both prothorax and elytral interstices devoid of distinct puncturation.................... *Meyricki*, Blackb.

EE. A very large broad species (long. 9-9½ lines)........................ *rugosicollis*, Macl.

DD. Width of interval between eyes not (or scarcely) less than length of 3rd joint of antennæ.

E. Elongate species.

F. A brilliantly nitid species of subcylindric form.................... *lepidus*, Blackb.

FF. Much less nitid; form elongate-oval.

G. Seriate puncturation of elytra extremely feeble.................. *inconspicuus*, Blackb.
GG. Seriate puncturation of elytra very well marked............ *yorkensis*, Blackb.
EE. A short species of very widely oval form.......................... *segnis*, Blackb.
DDD. Width of interval between eyes scarcely exceeding length of 2nd joint of antennæ. .... [*semiticus*, Pasc.]
CC. Tarsal vestiture fulvous.
D. Prothorax punctured (eyes bordered above the sulcus by a small carina).
E. Seriate punctures of elytra very large, some of them as wide as an interstice.............................. *catenulatus*, Blackb.
EE. Seriate punctures of elytra much smaller................. .... *carinaticeps*, Blackb.
DD. Prothorax impunctulate.............. *lævicollis*, Blessig.
BB. Legs red................................. *rufipes*, Macl.

CHALCOPTERUS CUPRIPENNIS, Hope.

Some time ago I forwarded a number of examples of Australian *Tenebrionidæ*, under the names with which I have, to the best of my ability, identified them, to Mr. G. C. Champion, the eminent European specialist in that family, and included among them various *Amarygmides*. Mr. Champion writes me that, having occasion to examine some of Hope's types in the Oxford University Museum, he took the opportunity to compare the specimen that I sent to him as *Cnodulon cupripenne*, Hope (which is identical with the insect that in the present memoir I have called *Chalcopterus cupripennis)*, with Hope's type, and found the latter to differ in the following respects, viz.—prothorax less black and more closely punctured, seriate punctures of elytra less distinct and more distant, interstices more thickly punctured, "&c." As these characters, if not strongly developed (with the exception of that concerning the colour of the prothorax), are in the main the characters that in Part I. of this memoir I have indicated as distinguishing the male from the female, and as I am not sure whether I sent to Mr. Champion a male, a female, or both sexes of the insect which I take to be *cupripennis*, Hope, I shall await further correspondence, with which I hope Mr. Champion will favour me, before I regard the correctness of my identification as disproved;* but I think it well to embody Mr. Champion's observation in this memoir, so that those who make use of the memoir may be on their guard to rely on my description of the insect rather than on the name, and to call it "*Chalcopterus cupripennis*, Blackb. (? Hope)," for the present, and until a further expression of opinion from Mr. Champion, which I doubt not that gentleman with his usual friendly courtesy will send me in due course, shall enable me to report to the Linnean Society more definitely on the point. It is of course likely enough that the "&c." at the end of Mr. Champion's note quoted above may include characters that will be quite decisive.

C. EXOLETUS, sp.nov.

C. difficili, Blackb., affinis; minus nitidus; elytris (exempli typici) purpureo, certo adspectu viridi-micantibus; antennis (♂ ?) apicem versus haud incrassatis, articulo 3° quam 4^{us} 5^{us}que conjuncti sat breviori, articulis 8-10 quam præcedentes nullo modo brevioribus; prothorace quam longiori (et postice quam antice) duplo minimum latiori; elytrorum puncturis seriatis postice minus fortiter impressis.

[Long. 7, lat. 4 lines.

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* In a later communication Mr. Champion expresses himself fully convinced that the differences are specific, a determination which I regard as conclusive. The insect that I have throughout this revision called *cupripennis*, Hope, must, therefore, bear the name of *affinis*, Blessig, if I am right in thinking that name to represent a mere var. of *cupripennis*, Blessig (nec Hope); it is with still greater certainty the species that Mr. Pascoe described subsequently as *A. Howitti*. It is undoubtedly, I think, the insect that Germar and Blessig believed to be *cupripennis*, Hope. Unfortunately, I followed them.

This species is so closely allied to *C. difficilis* that it seems needless to repeat the diagnosis at length, as the whole of it, subject to the exceptions noted above, may be read as applying to this species, which (placed besides *C. difficilis)* strikes the eye at once as a much larger and less nitid insect with a very evidently more transverse prothorax. On measurement the prothorax is found to be at least twice (or even a trifle more) as wide as long, whereas in *difficilis* the width is about once and four-fifths the length. It is unusual among the *Chalcopteri* to find the prothorax *by measurement* quite twice as wide as long, though in a good many species that segment appears so to a casual glance. The antennæ differ considerably from those of *C. difficilis* (as noted above), but it is doubtful whether the antennæ of the *same sex* in the two could be relied on to maintain those differences. The more transverse prothorax and less nitid surface, as well as the absence of well-defined ocular sulci, *inter alia* distinguish *C. exoletus* from *C. eremita*, Blackb. An example in Mr. French's collection of slightly more evenly oval form, with the green colour predominating and the whole sculpture a little "blurred," is, I think, only an aberrant specimen. It is from the same locality.

N. Queensland ; Palmer R. ; sent by C. French, Esq.

C. PROXIMUS, sp.nov.

C. modesto, Blackb., affinis ; oculis quam antennarum articuli basalis longitudine manifeste minus inter se remotis ; elytris subtiliter seriatim punctulatis, puncturis in seriebus inter se sat æqualibus sat crebre positis ; cetera ut *C. modesti.*

[Long. $3\frac{4}{5}$, lat. $2\frac{1}{5}$ lines.

This species is unsatisfactorily like *C. modestus* in its colouring and in most of its characters, but is distinguished from it by two characters which seem to me quite inconsistent with specific identity, the eyes being much more approximate *inter se* (separated by a space not much wider than the length of the 2nd joint of the antennæ) and the seriate puncturation of the elytra being quite on a different system [it consists of very fine deep punctures of very even size (a trifle larger in the outer than the inner series) placed quite closely in the rows, nearly as fine and closely placed as those of *C. cupripennis*, Blackb.]. This species also resembles *C. vigilans*, Blackb., but is very much smaller, with the eyes a little less approximate and the punctures of the elytral series deep and sharply defined, whereas in *vigilans* they are so faintly impressed that even on the discal part of the elytra they might almost be called subobsolete.

Queensland; Port Denison; sent by Mr. Masters.

C. CAIRNSI, sp.nov.

Sat late ovalis; sat convexus; minus nitidus; cyaneo-niger, prothorace sat læte cyaneo, elytris æneis obscure purpureo-tinctis; oculis quam antennarum articuli basalis longitudine multo minus inter se remotis; sulcis ocularibus haud plane nullis; antennis robustis quam corporis dimidium sat brevioribus, apicem versus parum incrassatis, articulo 2° quam 1^{us} 2^{us}que conjuncti vix longiori quam 4^{us} 5^{us}que conjuncti sat breviori, articulis apicalibus quam præcedentes haud brevioribus; prothorace quam longiori (et postice quam antice) fere duplo latiori, antice emarginato (vix bisinuatim), a basi antrorsum sat æqualiter sat arcuatim angustato, distincte subtiliter minus crebre punctulato, basi media sublobata, angulis obtusis; elytris modice (quam *C. variabilis*, Blessig, vix minus fortiter) sat æqualiter seriatim punctulatis, interstitiis planis sparsim subtilissime punctulatis; prosterno medio sulcato; metasterno medio distincte, abdomine subtilissime, sparsim punctulatis; hoc longitudinaliter subtiliter rugato; femoribus anticis antice sparsim distincte punctulatis; tarsis subtus nigro-setosis, posticorum articulo basali quam ceteri conjuncti manifeste breviori. [Long. 5¾, lat. 3½ lines.

This species is somewhat isolated, but its place in the tabulation is, I think, among its real allies. If its colouring is constant (I have seen only two specimens) it is easily known by the cyaneous tone of its undersurface, together with its bright blue prothorax and dull bronzy-æneous elytra, which are more or less tinged with dark purple. Its eyes are not bordered by true sulci, but the intermediate space being distinctly convex there is a slightly sulcate appearance to a casual glance where the lateral declivity of the intermediate space meets the eyes. If it were to be regarded as having ocular sulci, it would have to be placed beside the species that I take to be *C. semiticus*, Pasc., from which it differs *inter alia* by its very different shape and shorter 3rd joint of antennæ.

Queensland; Cairns district; sent by Mr. Masters.

C. MASTERSI, sp.nov.

(♂?) Late ovalis; nitidus; niger, elytris cæruleis vel viridibus purpureo-aureoque versicoloribus; capite sat æqualiter distincte punctulato; oculis quam antennarum articuli basalis longitudine sat magis inter se remotis; sulcis ocularibus fere nullis; antennis quam corporis dimidium sat brevioribus apicem versus vix incrassatis, articulo 3° quam 1^{us} 2^{us}que conjuncti parum longiori quam 4^{us} 5^{us}que conjuncti parum breviori, articulis apicalibus quam præcedentes haud brevioribus; prothorace subopaco quam longiori (et postice quam antice) fere duplo latiori, sat subtiliter sat crebre vix æqualiter punctulato, antice leviter bisinuatim emarginato, a basi antrorsum (superne viso) arcuatim angustato, basi media sublobata, angulis anticis obtusis posticis (superne visis) fere rectis; elytris a basi ad apicem manifeste striatis, striis postice profundioribus crebre sat subtiliter punctulatis (puncturis apicem versus majoribus), interstitiis fere planis sat crebre sat subtiliter punctulatis; prosterno medio antice carinato; metasterno in medio subtiliter (latera versus vix manifeste) punctulato ad latera oblique rugato, abdomine sparsim subtilissime punctulato et obscure rugato; femoribus anticis antice distincte sparsim punctulatis; tarsis subtus nigro-setosis, posticorum articulo basali quam ceteri conjuncti paullo breviori. [Long. 7½, lat. 4 lines.

A fine handsome species allied to *C. superbus*, Blackb., and *interioris*, Blackb., but differing from both by its wide oval form, as well as (so far as I can judge from the few examples I have seen) by the colours of its elytra not being arranged in well-defined longitudinal stripes. It resembles *C. longiusculus*, Blackb., (which is from the same locality) in the distinct striation of its elytra and to some extent in its colouring, but differs from it widely in other respects—its form being very different, its prothorax very much more transverse, &c., &c.

N. Territory of S. Australia; sent by Mr. Masters.

C. OBSOLETUS, Macl.

The following description of this insect has been furnished by Mr. Skuse, who kindly examined the type and re-described it.

"Black, elytra dull greenish-black or bronzy-green. Eyes separated by a wide interval as in (the species I regard as) *cupripennis*, Hope, and margined within by a weakly defined sulcus. Prothorax as in (the species treated in this Revision as) *fastuosus*, Germ., in shape, with strong close puncturation, almost confluent at sides. Elytra scarcely perceptibly striate, their entire surface strongly, very closely, and irregularly punctured, the punctures more numerous and stronger than in (the species treated in this Revision as) *fastuosus*, Germ."

The bracketed portions of the above are interjected by myself, as Mr. Skuse is of course not responsible for the correctness of my identifications. *C. obsoletus* is evidently, from the above description, closely allied to *C. fastuosus*, Germ., with which I have bracketed it in the tabulation of the species. Mr. Skuse considers it distinct from the insect I sent him as *fastuosus*, and I have no doubt he is right.

C. PROSPICIENS, sp.nov.

Elongatus; sat parallelus; sat nitidus; niger, elytris viridibus cupreo-tinctis; capite inter oculos punctulato; oculis quam antennarum articuli secundi longitudine minus inter se remotis; sulcis ocularibus nullis; antennis (exempli typici) fere carentibus; prothorace nitido quam longiori fere duabus partibus (postice quam antice fere duplo) latiori, sparsissime subobsolete punctulato, antice leviter emarginato, a basi antrorsum (superne viso) arcuatim angustato, basi media leviter sublobata, angulis anticis distinctis posticis (superne visis) obtusis; elytris seriatim punctulatis, puncturis seriatis subtilibus crebris, interstitiis planis fere subtilissime punctulatis; prosterno medio sulcato; metasterno (epipleuris inclusis) sparsim distincte punctulato et latera versus strigato; abdomine minus distincte punctulato longitudinaliter perspicue rugato; femoribus anticis antice sparsim subtiliter punctulatis; tarsis subtus nigro-setosis, posticorum articulo basali ceteris conjunctis longitudine sat æquali.

[Long. 7, lat. 3 lines.

An extremely elongate species resembling *C. perlongus* in general form, but with a small strongly convex prothorax more like that of *C. lævicollis*, Blessig. The prothorax is very nitid and distinctly (though quite faintly) impressed with very sparse punctures. The seriate puncturation of the elytra is very like that in *C. cupripennis*, Blackb., the puncturation of the interstices being a little finer and less close than in that species, but still quite distinct. The eyes so nearly meeting that they are separated by an interval narrower than the length of the 2nd joint of the antennæ is a character that distinguishes this insect from nearly all its congeners.

W. Australia; Nullabor Plains; sent by C. French, Esq.

C. VELUTINUS, W. S. Macl.

This species (the type of which I have had the advantage of inspecting, through the courtesy of Mr. Masters) is identical with an example from N. Queensland referred to by me under the heading of *C. obscurus* as possibly a local form of that insect, but more probably a distinct species. I am now satisfied that it is really distinct. It differs by its larger size (long. 7¾, lat. 4 lines), its prothorax markedly more transverse (fully once and three-quarters as wide as long), with sides less narrowed forward in their basal half and surface distinctly punctulate, and by the finer and closer punctures of its elytral series, which are not at all less fine and close than those of *C. cupripennis*, Blackb.

C. RUSTICUS, sp.nov.

Oblongo-ovalis; modice nitidus; niger, capite viridi-tincto, prothorace viridi (cupreo-tincto), elytris cupreo-purpureis (viridi-tinctis); capite sat subtiliter minus crebre punctulato; oculis quam antennarum articuli basalis longitudine vix magis inter se remotis; sulcis ocularibus fere nullis, antennis quam corporis dimidium multo brevioribus, articulo 3° 1° 2°que conjunctis longitudine sat æquali quam 4^{us} 5^{us}que conjuncti sat breviori, articulis 8-10 quam præcedentes manifeste brevioribus; prothorace quam longiori (et postice quam antice) fere duplo latiori, sat crebre sat subtiliter punctulato, antice modice emarginato, lateribus (superne visis) a basi antrorsum arcuatim angustatis, basi media sublobata, angulis anticis obtusis posticis (superne visis) subrectis; elytris sat subtiliter seriatim punctulatis, interstitiis planis subtilissime punctulatis; prosterno medio antice carinato; corpore subtus minus distincte punctulato; femoribus anticis antice sparsim sat perspicue punctulatis; tarsis subtus fulvo-setosis, posticorum articulo basali quam ceteri conjuncti multo breviori.

[Long. 7-8, lat. $3\frac{4}{5}$-$4\frac{1}{5}$ lines.

A robust species not very close to any-other known to me. The seriate puncturation of the elytra is similar to that of *C. variabilis*, Blessig, but it looks more conspicuous owing to the extreme fineness of the interstitial puncturation. In some respects this insect answers to the description of *C. obtusus*, Pasc., but I do not think it can be that species owing to the elytra of the latter being described as "haud versicolora," the tarsi as "slender" (they being rather exceptionally stout in the present insect), &c.

N. Queensland; Palmer R.; sent by C. French, Esq.

C. NOBILIS, sp.nov.

Ovalis; paullo elongatus; sat nitidus; niger, prothorace leviter viridi-tincto, elytris aureo-viridibus (puncturarum fundo purpureo); capite subtilius minus crebre punctulato; oculis quam antennarum articuli basalis longitudine vix magis

inter se remotis; sulcis ocularibus fere nullis; antennis quam corporis dimidium sat brevioribus, apicem versus vix incrassatis, articulo 3° quam 1^{us} 2^{us}que conjuncti sat longiori quam 4^{us} 5^{us}que conjuncti paullo breviori, articulis apicalibus quam præcedentes haud brevioribus; prothorace quam longiori (et postice quam antice) tribus partibus latiori, subtiliter vix crebre punctulato, antice emarginato, a basi antrorsum (superne viso) arcuatim angustato, basi media leviter sublobata, angulis (superne visis) obtusis; elytris seriatim foveatis, interstitiis planis subtilissime punctulatis; prosterno medio antice carinato; metasterno medio et abdomine sparsim subtiliter punctulatis, hoc obscure rugato; femoribus anticis antice sparsim subtiliter punctulatis; tarsis subtus fulvo-setosis, posticorum articulo basali apicalibus 2 conjunctis (unguibus exclusis) longitudine æquali.

[Long. 6½, lat. 3⅘ lines.

A very distinct species owing to the large foveiform punctures of the elytral series, two of which in one row form with the corresponding two of the next row the corners of a square. In the two examples that I have seen the elytra are of a deep rich green colour with golden reflections and the seriate foveæ are bright purple at the bottom.

N. Queensland; Cooktown; sent by Mr. French.

C. HUNTERENSIS, sp.nov.

Oblongo-ovalis; sat nitidus; niger, elytris cyaneis certo adspectu aureo- vel purpureo-micantibus; *C. minori*, Blackb., affinis; puncturis in elytrorum seriebus magis subtilibus, oblongis, magis sparsis; cetera ut *C. minoris*.

[Long. 5½-6, lat. 3¼-3½ lines.

Very like the Western Australian *C. minor*, but with the seriate punctures of the elytra very different, being extremely fine elongate points (almost scratches) placed in the rows very notably further apart from each other than are the corresponding punctures in *C. minor*. This species must bear considerable resemblance to *C. cœlestis*, Pasc., but the eyes of that insect are described as "approximate" (which certainly they are not in the specimens before me) and the seriate punctures as "rather fine"—a description that would have been quite insufficient if Mr. Pascoe had been dealing with the present insect. This species also resembles *C. lævicollis*, Blessig (which I take to be identical with *cœlestis*, Pasc.), but differs from it by its much more widely separated eyes devoid of ocular sulci, its non-trapezoidal prothorax, and the much finer seriate punctures of its elytra.

N.S.W.; Hunter R. district; sent by Mr. Masters.

C. PULCHER, sp.nov.

Elongato-ovalis, minus nitidus; niger, prothorace læte cæruleo, elytris cæruleis purpureo tinctis; capite subtiliter sat crebre punctulato; oculis quam antennarum articuli basalis longitudine fere magis inter se remotis; sulcis ocularibus nullis; antennis corporis dimidio longitudine æqualibus, apicem versus haud incrassatis, articulo 3° quam 1^{us} 2^{us}que conjuncti sat longiori quam 4^{us} 5^{us}que conjuncti vix breviori, articulis apicalibus quam præcedentes fere longioribus; prothorace quam longiori fere dimidio (postice quam antice plus quam duabus partibus) latiori, subtilissime distincte sat crebre punctulato, antice vix emarginato, a basi antrorsum (superne viso) arcuatim angustato, basi media sublobata, angulis omnibus (superne visis) obtusis; elytris sat fortiter seriatim punctulatis (fere ut *C. amethystini*, Fab.), interstitiis planis vix perspicue punctulatis; prosterno medio antice carinato; corpore subtus quam supra multo magis nitido, vix perspicue punctulato, obscure rugato; femoribus anticis antice distincte minus sparsim punctulatis; tarsis subtus fulvo-setosis, posticorum articulo basali quam ceteri conjuncti paullo breviori. [Long. 6, lat. 3 lines.

This species is so remarkably like *C. amethystinus*, Fab., that I should regard it as a black-legged variety of that insect were it not for the bright fulvous vestiture of the underside of its tarsi and the puncturation (very obsolete, but quite traceable) of its elytral interstices. Its eyes are about as far apart from each

other as those of *C. variabilis*, Blessig. I do not think it can be *cœlestis*, Pasc., as the author of that species says that its eyes are approximate, and distinguishes it from *amethystinus* by *(inter alia)* its black prothorax.

C. OCULARIS, sp.nov.

Elongato-ovalis ; sat nitidus ; niger (exempli typici) prothorace viridi, elytris cupreo-purpureis certo adspectu latera versus viridi-tinctis ; capite crebre punctulato ; oculis subcontiguis ; sulcis ocularibus nullis ; antennis quam corporis dimidium vix brevioribus apicem versus haud incrassatis, articulo 3° quam 1^us^ 2^us^que conjuncti vix longiori quam 4^us^ 5^us^que conjuncti multo breviori, articulis apicalibus quam præcedentes haud brevioribus ; prothorace quam longiori dimidio (postice quam antice tribus partibus) latiori, leviter minus crebre minus subtiliter punctulato, antice bisinuatim leviter emarginato, a basi antrorsum arcuatim angustato, basi media sublobata, angulis obtusis ; elytrorum sculptura tota fere ut *C. cupripennis*, Blackb. ; prosterno medio carinato ; corpore subtus obsolete sparsim vix subtiliter punctulato ; femoribus anticis antice sparsim subtiliter punctulatis ; tarsis subtus fulvo-setosis, posticorum articulo basali ceteris conjunctis (unguibus exceptis) longitudine æquali. [Long. 7, lat. 3 lines.

An isolated species at once distinguishable from all others of the genus known to me by its eyes almost contiguous in front ; they are separated by a mere filament scarcely wider than the diameter of one of the granules of the eyes. In general form this insect resembles *C. longipennis*, Hope.

Queensland.

C. LEAI, sp.nov.

C. longipenni, Hope (ut supra descripto) affinis ; differt corpore subtus haud iridescenti, oculis quam antennarum articuli basalis longitudine paullo magis inter se remotis, antennis paullo brevioribus magis robustis ; prothorace quam longiori (et postice quam antice) fere duplo latiori, minus nitido, minus fortiter punctulato in parte basali minus distincte

antrorsum angustato; elytris multo magis fortiter (quam *C. variabilis*, Blessig, fere magis fortiter) seriatim punctulatis, interstitiis vix subconvexis, tarsis subtus fulvo-setosis; cetera ut *C. longipennis*. [Long. 8½, lat. 4⅕ lines.

This species presents one of the difficulties of tabulation which I have found it impossible to exclude in dealing with this genus. It belongs to the aggregate having the following characters in combination—ocular sulci absent, underside not iridescent, tarsal vestiture fulvous. This aggregate I have divided into two groups, in one of which the prothorax is gradually narrowed forward from the base, while in the other that segment is of equal width from the base to the middle. But the prothorax in this species does not seem quite in place in either of those groups, being when viewed from above very little (but still perceptibly) narrowed from the base to the middle and then much more strongly thence to the front. I have with some hesitation placed the insect in the former of the two groups; if it were regarded as belonging to the second of them, it would stand beside *colossus*, Blackb., from which it is at once distinguished *inter alia* by the very much larger punctures of its elytral series. From the Western Australian *C. similis* it is separated *inter alia* by its very much more transverse prothorax, as well as by the larger punctures of its elytral series. It may be noted that there is a small obscure carina close to the inner margin of each eye, and that the anterior inner corners of the eyes are cut very obliquely, so that the space between the eyes narrows considerably hindward—characters which I do not find in any very nearly allied species.

N. S. Wales; taken near Forest Reefs by Mr. Lea, of the Agricultural Department.

C. PALMERENSIS, sp.nov.

Sat latus; minus nitidus: elytris (exempli typici) obscure cyaneis purpureo-tinctis; oculis quam antennarum articuli basalis longitudine haud magis inter se remotis; antennarum articulo 3° quam 1^{us} 2^{us}que conjuncti breviori quam 4^{us} 5^{us}que conjuncti sat multo breviori; prothorace haud valde convexo,

sat sparsim punctulato; elytrorum puncturis seriatis apicem versus magis magnis magis profundis, interstitiis vix convexis; metasterno in medio subtiliter ad latera sat crasse punctulato; abdomine sat subtiliter punctulato; cetera ut *C. colossi*, Blackb. [Long. 10, lat. 5½ lines.

A large species closely allied to *C. colossus*, Blackb., but of wider and more robust build and more obscurely coloured. In the unique specimen known to me of this insect the tarsal vestiture has been much matted, and I have not been able to restore it very satisfactorily. In its present condition the vestiture is of a pitchy-black tone in general, but in places is distinctly fulvous, and I have no doubt the tarsal vestiture in a fresh example is entirely fulvous. Subject to the differences specified in the diagnosis above, the diagnosis of *C. colossus* may be read as applying to this insect.

N. Queensland; Palmer R.; sent by C. French, Esq.

C. LATICOLLIS, sp.nov.

C. colosso affinis; differt prothorace quam longiori (et postice quam antice) fere duplo latiori, in medio quam ad basin manifeste latiori; elytrorum puncturis seriatis minus subtilibus. [Long. 8-9½, lat. 4⅕-4⅘ lines.

This species is nearer to *colossus* than I like, but the differences seem to be of a kind that cannot but be specific; indeed, the form of the prothorax in the present insect (of which I have seen a good many examples) is alone sufficient to form a distinction from every other *Chalcopterus* that I have seen, that segment being at its widest at the middle and thence slightly narrowed to the base.

Queensland.

C. GRACILIOR, sp.nov.

C. Bovilli valde affinis; corpore supra læte cyaneo vel violaceo (capite obscuriori) certo adspectu viridi-tincto; corpore subtus splendide metallico-iridescenti; antennis (♀ ?) quam corporis dimidium paullo breviori; prothorace magis sub-

tiliter magis crebre punctulato; elytrorum interstitiis crebre perspicue punctulatis; cetera ut *C. Bovilli.*

[Long. 5, lat. 2⅕ lines.

The diagnosis of *C. Bovilli* may be read as applying to this species except in respect of the characters mentioned above. It is possible that the unique type of *C. Bovilli* may be a black var. of a species that is ordinarily brightly coloured. If that be the case, and if I am right in thinking that that type is a male and that I have not seen a male of *C. gracilior* (in which case both the antennal differences and those in colour might be non-specific), the two species are excessively closely allied; but even so, I think them to be certainly distinct on account of the very marked difference in their sculpture, the puncturation of the prothorax in *gracilior* being very considerably finer and closer than in *Bovilli*, while the interstices of the elytral striæ in the former are very distinctly punctured and in the latter all but impunctate, the punctures being scarcely discernible even with a powerful Coddington lens. In my tabulation this insect falls in a small very polymorphous group of species associated by the unusual and conspicuous (but not really important) character of the undersurface being iridescent and of metallic colours.

N. Queensland; Palmer R.; sent by Mr. French.

C. IRIDICOLOR, Blessig.

The Victorian insect, to which I somewhat confidently apply this name, presents the following characters in combination:—ocular sulci at their maximum development (very wide, deep, and long,—not foveiform), tarsal vestiture black or nearly so, interval between the eyes (including the sulci) just about equal to the length of the basal joint of the antennæ, size at most moderate. These characters are shared with several other forms, which I believe to be good species, but the group of *Chalcopteri*, consisting of the species thus distinguished presents to me much greater difficulties than any others of the genus; for on the one hand it contains some most variable species, and on the other hand it seems likely (yet incapable of being definitely established by me) that several already-named *Chalcopteri* appertain to it.

Among the specimens presenting the combination of characters mentioned above, I distinguish *C. iridicolor* by the following combination:—ocular sulci of more perfectly even form, and therefore more entirely devoid of any deepening in front suggestive of a fovea, general form robust and elongate oval (not very parallel), puncturation of prothorax very sparse, elytra usually marked with rather well-defined longitudinal stripes of green, golden and purple, seriate punctures of elytra very unequal in size (some of the punctures in the series being much larger than others), seriate puncturation in general rather coarse and not close (evidently, but not very much less fine than in *C. variabilis*, Blessig), interstices scarcely quite flat (at any rate in the male), very finely and not closely (especially in the male) punctured.

Closely allied to the above is a species which seems to be very variable and very widely distributed, and common in N. S. Wales, and which I take to be *C. vinosus*, Pasc. I feel some doubt as to whether it may not eventually prove to be a form of *C. iridicolor*. In what I take to be its typical form, this insect is smaller, narrower and more parallel than *iridicolor*, its elytra are not striped with various colours, but the whole upper surface appears to be of a uniform green or reddish-coppery colour, according to the point of view. The ocular sulci have just the least indication of an anterior dilatation (a very slight character, however), the prothorax is a little more closely punctured, the seriate punctures of the elytra are a little finer, the interstices are more absolutely flat and much more strongly punctured (the sculpture of the elytra is extremely like that of *variabilis*, Blessig, but the seriate punctures are a little less close, and the interstitial punctures are a little stronger). The tarsal vestiture is not quite so black, some piceous or even reddish hairs being mingled among the black ones.

If the form just described were the only one of this insect, it would appear to be quite distinct from *C. iridicolor*, but either it varies to an extraordinary extent, or there are several very closely allied species between which I have failed to find any reliable distinctions, for among upwards of a hundred specimens which I have examined, I find some in which the seriate punctures of the elytra are quite as large as in *iridicolor* (with intermediate shades of difference), and a few in which the colours approximate a little to *iridicolor,* while in a few (otherwise indistinguishable) the interstices are almost impunctate, and in some (all, I think, from the northern parts of N. S. Wales) the red hairs in the tarsal vestiture are quite as plentiful as the black ones. In all probability *Amarygmus resplendens,* Boisd., is one of these varieties.

These variations, if they be mere variations, are especially remarkable because in other species of *Chalcopterus* the sculpture seems very constant, scarcely varying for example in *C. cupripennis,* Blackb., (of which I have examined large numbers), except in the slight sexual variation that I have referred to in describing that insect.

C. VIRIDICOLLIS, W. S. Macl.

This is an extremely distinct species, not very near any other that I have seen. In a natural arrangement of the *Chalcopteri* it would probably stand not far from *lætus,* Blackb., but the exigencies of classification require me to place it at the other end of the genus on account of its having perfectly distinct (though not very greatly developed) ocular sulci. It is an oval, somewhat elongate, moderately convex species of moderate size (long. 6, lat. 3⅕ lines). The type is coloured as follows :—head and prothorax dark rich green, elytra coppery or golden or purple, according to the point of view, undersurface iridescent (blue, green and purple), legs and antennæ black. The antennæ (♀ ?) are considerably shorter than half the length of the body, and are not much thickened towards the apex, joints 8-10 not much shorter than the joints immediately preceding them. The clypeus and labrum are closely punctured, the rest of the head very sparsely. The space between the eyes is moderately wide (about ¾ of the width of the same in *C. cupripennis,* Blackb.), and in the type is of peculiar form, its front and hind part resembling two plates applied to each other almost at a right angle (of course without any suture), so that the vertex almost continues the plane of the prothorax, and then suddenly becomes nearly vertical. The prothorax is not much more than half again as wide as its length, the front margin not quite $\frac{3}{5}$ the width of the base, the sides feebly arched, the surface punctured finely and sparsely. The elytra bear very even and distinct rows of punctures, the punctures moderately large (somewhat larger and less close than those in the series on the elytra of *C. variabilis*, Blessig), and the interstices are nitid and impunctate. The underside is almost devoid of sculpture. The vestiture of the undersurface of the tarsi is black, the basal joint of the hind tarsi being very little longer than the apical joint. The exact habitat is uncertain, the unique type being ticketed "New Holland." The ocular sulci being not very strong, it is perhaps well to note that if it were placed among the species not having distinct ocular sulci in my tabulation it would have to stand beside *C. iridiventris*, from which the very much coarser seriate puncturation of its elytra at once distinguishes it.

C. EREMITA, Blackb. (Scientific Results of the Elder Expedn. Trans. Roy. Soc. S.A. xvi. p. 44).

This species, it should be noted, bears much resemblance to *C. difficilis*, Blackb., but may be readily distinguished by, *inter alia*, its better defined and longer ocular sulci, and the seriate punctures of its elytra becoming very feeble near the apex, whereas in *difficilis* the corresponding punctures extend quite to the apex without any enfeeblement.

C. SEGNIS, sp.nov.

Late ovalis, sat nitidus; niger elytris viridibus; capite subopaco, subobsolete punctulato; oculis quam antennarum articuli 3^{1} longitudine paullo magis inter se remotis; sulcis ocularibus subfoveiformibus; antennis quam corporis dimidium sat brevioribus (♀ prothoracis basin parum superantibus), apicem versus vix incrassatis, articulo 3° quam 1^{us} 2^{us}que conjuncti vix longiori quam 4^{us} 5^{us}que conjuncti sat breviori, articulis apicalibus quam præcedentes vix brevioribus; prothorace quam longiori (et postice quam antice) plus quam duplo latiori, subobsolete punctulato, subopaco, antice sinuatim emarginato, a basi antrorsum (superne viso) arcuatim angustato basi media sat late sublobata, angulis obtusis; elytris a basi ad apicem (prope basin minus distincte) subtiliter (fere ut *C. cupripennis*) seriatim-punctulatis, interstitiis planis sat perspicue nec crebre punctulatis; prosterno medio antice carinato; metasterno medio et abdomine sparsim manifeste punctulatis; femoribus anticis antice minus subtiliter punctulatis; tarsis subtus nigro-setosis, posticorum articulo basali quam ceteri conjuncti paullo breviori.

[Long. 6-7, lat. $3\frac{3}{5}$-4 lines.

The two examples examined are both quite black except the elytra, which are of dark but very decided green colour, without iridescence other than a slightly golden tone in certain lights. The general form is that of *semiticus*, *simius*, and *cupripennis* (though the last named is not quite so *widely* oval), from which it may be separated by the following characters *inter alia*—from *semiticus* by its widely separated eyes, from *simius* by the much more defined seriate puncturation of its elytra, from *simius* and *cupripennis* by its well-defined ocular sulci.

N. Queensland; sent by Mr. French.

C. LÆVICOLLIS, Blessig.

This is one of the few species of *Chalcopterus* that I have ascertained to be widely distributed in Australia. It does not appear to be very common. I do not feel much doubt of its being the insect that Hope described as *Cnodulon cyanipennis*, Boisduval as *Amarygmus columbinus*, and Pascoe as *Amarygmus cœlestis.* If those identifications are correct, Boisduval's is the name that will have to be adopted; but as, among the names in question, Blessig's is the only one connected with a description and figure good enough to justify anything like certainty, it is no doubt better to use that name for the present, and hope that someone having access to the types of the other authors mentioned above will examine them and report whether they are likely to be identical with *lævicollis.* It is an extremely isolated species, and can be at once distinguished from all the other *Chalcopteri* that I have seen by the following characters in combination—ocular sulci well defined, tarsal vestiture fulvous, legs dark, prothorax subtrapezoidal and impunctate. I may note that I have seen two examples from Narrabri, N.S.W., sent by Mr. Masters for examination, which differ from typical specimens of *C. lævicollis* only in being larger (long. 7 lines) and having green elytra ; it is just possible that this form may be that which Boisduval named *columbinus*, and I think it a mere variety of *lævicollis*, Blessig.

C. PICIPES, Macl.

Mr. Skuse has had the kindness to examine the type of this insect for me, and reports that the only difference he can find between it and *rufipes*, Macl., is in the elytra of the former being of a greenish colour.

The following are the species of *Chalcopterus* described since the publication of Mr. Masters' Catalogue of Coleoptera and before the date of this Revision.

C. LONGIUSCULUS, Blackb., P.L.S.N.S.W. 1888, p. 1435.

C. EREMITA, Blackb., Trans. Roy. Soc. S.A. Vol. xvi. p. 44.

C. MEYRICKI, Blackb., loc. cit. p. 45.

AMARYGMUS.

The name *Amarygmus* has been limited by M. Blessig to those species which present the characters that I have enumerated in the first part of this memoir as distinctive of *Chalcopterus*, with the exception that their mandibles are bifid at the apex. Notwithstanding M. Blessig's work, however, subsequent authors have ignored the distinction and attributed to *Amarygmus* the species that M. Blessig would have called *Chalcopteri* without even referring to the structure of the mandibles. It is therefore a matter of some difficulty in revising the *Amarygmides* to apportion the species confidently between the two genera, except in those instances where it is possible to identify them on other characters. Fortunately there are fairly marked differences of other kinds distinguishing *Amarygmus* from *Chalcopterus*, so that it is practicable in the case of most of the described species to make at least a very good guess from the descriptions to which genus they belong. The species with truncate mandibles are never (judging from many hundreds of specimens that I have examined) of very small size, whereas those with bifid mandibles include many such and none very large; the vestiture of the tarsi in the species with bifid mandibles is always of bright fulvous colour, whereas the vestiture in those with truncate mandibles is usually black; in the former the clypeus is, with scarcely an exception, much less reflexed above the base of the antennæ than in the latter; in the former there are almost never well-defined ocular sulci, and the colour of the legs is much more variable, not a few species having them entirely rufous and many having black legs with testaceous or rufous tarsi, while in the latter the ocular sulci are often very strongly developed, and with one or two exceptions (in which the whole legs, or the femora only, are rufous) the legs are entirely black or pitchy-black. The following species I can attribute definitely to *Amarygmus* as the result of the examination of well authenticated specimens, viz.—*convexiusculus*, Macl.; *convexus*, Pasc.; *exilis*, Pasc.; *foveolatus*, Macl.; *striatus*, Macl.; *torridus*, Pasc.; *tyrrhenus*, Pasc.; *variolaris*, Pasc.; and I have no doubt, judging from their general characters, that the following are also *Amarygmi*, viz.—*cupido*, Pasc.; *ellipsoides*, Pasc.; *indagaceus*, Pasc.; *maurulus*, Pasc.; *minutus*, Pasc.; *picicornis*, Hope; *pusillus*, Pasc.; *semissus*, Pasc.; *tarsalis*, Pasc.; and *tristis*, Fab. Of these latter I have identified more or less confidently—*cupido*, Pasc.; *indagaceus*, Pasc.; *minutus*, Pasc.; *semissus*, Pasc.; *tarsalis*, Pasc.; and *tristis*, Fab. There are thus four species that I have been unable to identify and am obliged to pass over in silence, viz.—*ellipsoides*, Pasc.; *maurulus*, Pasc.; *pusillus*, Pasc.; and *picicornis*, Hope. I do not think that I have seen any of those four, but there is a possibility that I may have re-described some of them, as their description is in no case very full or detailed.

The known *Amarygmi* are much less numerous than the *Chalcopteri* and the species are much rarer in collections. It is noteworthy that I have seen only a single species from Western Australia or Tasmania, and only three species from South Australia and Victoria, two of which are represented by unique types.

A. Prothorax not strigose.

B. Elytral sculpture distinctly longitudinal.

C. Elytral sculpture consisting of punctulate striæ or rows of punctures.

D. Prothorax or interstices of elytra, or both, distinctly punctulate.

E. Form more or less elongate.

F. Tibiæ of dark colour.

G. Elytra uniformly black or æneous, very nitid, and strongly striate.

H. Size 5 lines or more.

I. The punctures in the elytral striæ very uneven in size and distance apart.......... *uniformis*, Blackb.

II. The punctures in the elytral striæ very even, a little finer hindward............. *alienus*, Blackb.

HH. Size 4 lines or less........... [*semissus*, Pasc.]

GG. Elytra not as in G.

H. Head between the eyes more or less nitid and very distinctly punctulate.

I. Sides of head extremely feebly reflexed above the base of the antennæ.

J. Elytra not or scarcely striate

K. Metasternum (at least on sides) not or scarcely punctulate.

L. Elytra variegated with several metallic colours

M. 3rd joint of antennæ notably longer than 5th.

N. Antennæ black or pitchy-black.

O. Sides of prothorax considerably rounded..................... *æger*, Blackb.

OO. Sides of prothorax nearly straight... *suavis*, Blackb.

NN. Antennæ rufous or testaceous.

O. Abdomen very strongly punctured........ *ruficornis*, Blackb.

OO. Abdomen very feebly punctured...... [*cupido*, Pasc.]

MM. 3rd joint of antennæ scarcely longer than 5th........... *exilis*, Pasc.

LL. Elytra of a uniform deep blue or violet colour.................. *indagaceus*, Pasc.

KK. The whole metasternum (except the episterna) coarsely punctured.... *pectoralis*, Blackb.

JJ. Elytra distinctly striate from base to apex........ *Frenchi*, Blackb.

II. Sides of head much more reflexed above the base of the antennæ................ *tyrrhenus*, Pasc.

HH. Head between the eyes more opaque and scarcely punctulate.

I. Elytra substriate, seriate punctures fine................ [*tristis*, Fab.]

II. Elytra not striate, seriate punctures subfoveiform.. *porosus*, Blackb.

FF. Tibiæ clear rufous.

G. Prothorax finely punctured and very nitid.

H. Size moderate — 3 lines or more.......................... *stolidus*, Blackb.

HH. Size very small.............. *lilliputanus*, Blackb.

GG. Prothoracic punctures strong and close, tending to be longitudinally confluent in places......................... *rutilipes*, Blackb.

EE. Form very widely oval (like *convexus* and *tardus*)......... *torridus*, Pasc.

DD. Prothorax and interstices of elytra both impunctate or nearly so.

E. Femora and tibiæ dark.

F. Form narrow and subparallel.... *tarsalis*, Pasc.

FF. Form oval, and much wider.... *foveolatus* Macl.

EE. Femora and tibiæ clear rufous.

F. Form narrow.......................... *convexiusculus*, Macl.

FF. Form very widely and roundly oval............................. *convexus*, Pasc.

CC. Elytral sculpture consists of striæ which are crenulate rather than punctulate and nearly simple near apex.

D. Legs dark.

E. Punctures of the striæ closely placed.

F. Interstices of elytral striæ not (or scarcely) punctulate.

G. Interstices of elytral striæ not (or very little) convex near apex.

H. Elytra black.................... *striatus*, Macl.

HH. Elytra blue................... *queenslandicus*, Blackb.

GG. Interstices quite sharply convex near apex.

H. Curve of elytral outline (viewed from the side) very strong, interstices cariniform.................... *pinguis*, Blackb.

HH. Curve of elytral outline (viewed from the side) much feebler, interstices not cariniform............ *perplexus*, Blackb.

FF. Interstices very distinctly punctulate...................... *diaperioides*, Blackb.

EE. Punctures of the striæ very distant from each other........ *cuprea*, Pasc. [*Eurypera.*]

DD. Legs clear rufous.................. [*minutus*, Pasc.]

CCC. Elytral sculpture consisting of large purple foveæ.

D. Size small (long. 3½ lines)........... *lindensis*, Blackb.
DD. Size much larger.
E. Form widely oval.................... *tardus*, Blackb.
EE. Form narrow and very parallel *rimosus*, Blackb.
BB. Elytral sculpture not running in longitudinal rows.................... *variolaris*, Pasc.
AA. Prothorax densely strigose............ *rugaticollis*, Blackb.

A. ALIENUS, sp.nov.

Ovalis; sat nitidus; subtus niger supra totus viridi-æneus haud iridescens, antennis pedibusque plus minusve piceis vel ferrugineis; capite crebre sat subtiliter punctulato; oculis quam antennarum articuli basalis longitudine vix minus inter se remotis; sulcis ocularibus nullis; antennis sat elongatis, articulo 3° quam 1^{us} 2^{us}que conjuncti vix longiori quam 4^{us} 5^{us}que parum breviori, articulo 8° quam 7^{us} paullo breviori (ceteris exempli typici carentibus); prothorace quam longiori fere duplo (postice quam antice fere tribus partibus) latiori, crebre obsolete punctulato, antice sat fortiter emarginato, a basi (superne viso) antrorsum arcuatim angustato, basi media sat anguste sublobata, angulis anticis sat productis minus obtusis; elytris sat æqualiter striatis, striis fortiter punctulatis, puncturis in seriebus sat crebre positis a serierum lateralium parte mediana antrorsum retrorsum et suturam versus gradatim magis subtilibus, interstitiis sat convexis sat crebre obsolete (vix perspicue) punctulatis; prosterno medio sat profunde sulcato; metasterno medio subtiliter punctulato et transversim rugato, episternis sat opacis vix punctulatis; abdomine subtiliter punctulato et sat fortiter rugato; femoribus anticis antice leviter punctulatis; tarsis subtus fulvo-setosis, posticorum articulo basali quam apicalis vix longiori. [Long. 6, lat. 3½ lines.

Much like *A. uniformis*, Blackb., but with very different elytral puncturation. The typical example appears to be a male; its

front tibiæ are somewhat arched and decidedly thickened near the apex; its hind tibiæ are rather strongly flexuous.

Victoria; Alpine district; sent to me by Mr. French.

A. ÆGER, sp.nov.

Anguste elongatus; sat parallelus; modice nitidus; niger, capite prothorace elytrisque (minus læte) versicoloribus, æneis certo adspectu viridi- et purpureo-tinctis (exemplorum plurimorum sutura obscure purpurea); capite crebre æqualiter sat subtiliter punctulato; clypeo minus elongato, a fronte sulco transverso lato profundo diviso supra antennarum basin parum reflexo; oculis quam antennarum articuli basalis longitudine sat magis inter se remotis; sulcis ocularibus nullis; antennis quam corporis dimidium sat brevioribus, apicem versus vix incrassatis, articulo 3° quam 5^{us} multo longiori, articulis apicalibus quam præcedentes haud brevioribus; prothorace quam longiori fere duabus partibus (postice quam antice plus quam tertia parte) latiori, crebre distincte punctulato, antice sinuatim emarginato, a basi antrorsum subarcuatim angustato, basi media sublobata, angulis anticis obtusis posticis subrectis; elytris substriatis, sat profunde nec grosse seriatim punctulatis, puncturis in seriebus (sat æqualiter) crebris, interstitiis planis subtiliter sat crebre punctulatis; prosterno medio sulcato; corpore subtus vix distincte punctulato; femoribus anticis antice vix distincte punctulatis; tarsis subtus fulvo-setosis, posticorum articulo basali quam ceteri conjuncti sublongiori.

[Long. 4½-6, lat. 1⅘-2½ lines.

A narrow elongate species with elytral puncturation much resembling that of *Chalcopterus variabilis*, Blessig, the interval between the eyes very little less wide than in *C. cupripennis*, the front tibiæ of the male arched and having their apical portion moderately dilated. It is I think the commonest and most widely distributed species of the genus. The striation of the elytra is very indistinct, in some examples scarcely traceable.

South Australia, Victoria, and N. S. Wales.

A. SUAVIS, sp.nov.

Elongato-ovalis; nitidus; niger, elytris versicoloribus (purpureis, viridi- cyaneo- et aureo-tinctis), antennarum apice tarsisque obscure testaceis; antennis oculis et capite toto fere ut *A. ægri* sed clypeo a fronte sutura usitata diviso; prothorace quam longiori tribus partibus (postice quam antice duabus partibus) latiori, distincte vix crebre punctulato, antice sinuatim emarginato, lateribus fere rectis, basi media sublobata, angulis anticis subprominulis posticis obtusis; elytris seriatim punctulatis, puncturis in seriebus sat magnis nec inter se æqualibus, interstitiis sat planis minus perspicue (nisi sub lente forti) punctulatis; prosterno (exempli typici) medio planato; metasterno medio et abdominis parte antica-mediana puncturis sparsis minus subtilibus impressis; femoribus anticis antice vix manifeste punctulatis; tarsis subtus fulvo-setosis, posticorum articulo basali quam ceteri conjuncti subbreviori. [Long. $3\frac{1}{2}$, lat. $1\frac{1}{2}$ lines.

This species is not very close to any other that I have seen; perhaps it comes nearest to *A. cupido*, Pasc., but differs from it by its darker antennæ (with only the apical joints a little paler) and its colour, *cupido* (according to description and an example in my collection which I refer to it) being a much more beautifully coloured species with light blue iridescence, and (if my identification is correct) more finely punctured prothorax and elytra. In the present species the prothoracic puncturation resembles that of *Chalcopterus cupripennis* but is a little closer, and the seriate punctures of the elytra are of somewhat unequal size (the larger ones being distinctly larger than those of *Chalcopterus variabilis*, Blessig) and not very close,—the intervals between puncture and puncture being in places not much less than the diameter of a puncture; the largest punctures are near the front of the dorsal series.

N. S. Wales; taken near Sydney by Mr. Lea.

A. RUFICORNIS, sp.nov.

Elongato-ovalis; nitidus; niger, elytris versicoloribus (purpureis, cyaneo- et aureo-tinctis), antennis tarsisque testaceis; antennis (colore excepto) oculis et capite toto fere ut *A. ægri* sed clypeo a fronte sutura usitata diviso et capite inter oculos sat sparsim punctulato; prothorace fere ut *A. suavis* sed minus transverso (quam longiori, et postice quam antice, duabus partibus latiori) et paullo magis subtiliter punctulatis; elytris fere ut *A. suavis*, sed puncturis seriatis magis subtilibus (fere ut *Chalcopteri variabilis*, Blessig); corpore subtus et pedibus fere ut *A. suavis* sed metasterno et abdominis parte antica-mediana fortiter crebre punctulatis.

[Long. $2\frac{4}{5}$-3, lat. $1\frac{2}{5}$ lines.

The diminutive size of this insect distinguishes it from most of its congeners; its most distinctive character however is the puncturation of its undersurface, which on the middle of the metasternum and the basal segment of the abdomen is distinctly coarse and close.

N. S. Wales; taken in the Richmond R. district by Mr. Lea.

A. PECTORALIS, sp.nov.

Elongato-ovalis; sat nitidus; supra obscure cyaneus vel violaceus, subtus niger, pedibus piceo-nigris, tarsis paullo dilutioribus; antennis oculis et capite toto fere ut *A. ægri* sed clypeo a fronte sulco minus profundo diviso; prothorace quam longiori duplo (postice quam antice fere duabus partibus) latiori, subtiliter sat crebre punctulato, antice sinuatim leviter emarginato, a basi antrorsum arcuatim angustato, basi media manifeste lobata, angulis obtusis (anticis fere subacuminatis); elytris seriatim punctulatis, puncturis in seriebus sat magnis nec inter se æqualibus (fere ut *A. suavis*), interstitiis sparsim subtilissime (vix manifesto) punctulatis; prosterno medio sulcato; metasterno toto grosse sparsim (episternis subtiliter exceptis) punctulato; abdominis segmento basali grosse (ceteris subtiliter) punctulato; femoribus anticis antice vix manifeste punctulatis; tarsis subtus fulvo-setosis, posticorum articulo basali ceteris conjunctis longitudine sat æquali. [Long. $4\frac{2}{5}$, lat. $2\frac{1}{5}$ lines.

This species bears a good deal of resemblance to *A. suavis* but is considerably larger, with the prothorax and elytral interstices more finely punctured; it differs from all its allies known to me in having the whole of its metasternum (except the episterna) sparsely pitted with coarse deep puncturation.

N. S. Wales; sent to me by Mr. Masters.

A. FRENCHI, sp.nov.

Ovalis; sat nitidus; supra læte versicolor (purpureo- cyaneo- et viridi-variegatus), corpore subtus nigro, antennis versus basin (exempli typici parte apicali carente) pedibusque obscure brunneo-piceis; capite crebre sat subtiliter punctulato supra antennarum basin parum reflexo; oculis quam antennarum articuli 2^{i}·longitudine vix magis inter se remotis; sulcis ocularibus nullis; prothorace quam longiori duplo (postice quam antice fere duplo) latiori, crebre subtiliter punctulato, a basi antrorsum arcuatim angustato, antice emarginato, basi media sublobata, angulis obtusis; elytris distincte subtiliter striatis, striis crebre subtilius seriatim punctulatis, interstitiis leviter convexis crebre subtiliter punctulatis; prosterno sat lato in medio depresso; metasterno sparsim subtiliter punctulato et oblique rugato; abdomine vix perspicue punctulato, sat fortiter longitudinaliter strigato; femoribus anticis antice vix manifeste punctulatis; tarsis subtus fulvo-setosis.

[Long. $5\frac{1}{2}$, lat. $2\frac{4}{5}$ lines.

The unique type of this insect is unfortunately not in good condition, having lost its hind tarsi and part of its antennæ, but it is so extremely distinct a species that I am reluctant to omit it from this memoir. It is the only *Amarygmus* known to me having elytra distinctly punctulate-striate in the ordinary sense of the term, the other striate species having their striæ crenulate on the sides rather than distinctly punctured. In this species the striæ though fine are well defined and become deeper towards the apex

and are set with fine close punctures much like the seriate punctures of *Chalcopterus cupripennis* but a little more crowded and more deeply impressed; the interstices of the striæ are distinctly convex especially near the apex. The anterior coxæ are more widely separated and the eyes much more contiguous than in most *Amarygmi*. In general appearance this insect is much more like a *Chalcopterus* than an *Amarygmus*.

Victoria; presented to me by Mr. French.

A. POROSUS, sp.nov.

Ovalis; minus angustus; subnitidus; niger, elytris obscure viridibus, antennis tarsisque rufo-piceis; capite antice crebre subtiliter postice minus distincte punctulato supra antennarum basin leviter reflexo; oculis quam antennarum articuli basalis longitudine paullo minus inter se remotis; sulcis ocularibus haud plane carentibus; antennis quam corporis dimidium vix brevioribus, apicem versus leviter incrassatis, articulo 3° quam 4^{us} 5^{us}que conjuncti vix breviori, articulis apicalibus quam præcedentes vix brevioribus; prothorace quam longiori (et postice quam antice) duplo latiori, distincte sat crebre punctulato, antice sinuatim emarginato, a basi antrorsum arcuatim angustato, basi media sublobata, angulis anticis subacutis posticis fere rectis; elytris seriatim foveolatis, interstitiis planis subtiliter punctulatis; prosterno medio sulcato; corpore subtus vix manifeste punctulato, abdomine subreticulatim strigato; femoribus anticis antice sparsim vix perspicue punctulatis; tarsis subtus fulvo-setosis, posticorum articulo basali quam ceteri conjuncti paullo breviori. [Long. 5¾, lat. 3⅕ lines.

This species is allied to *A. torridus*, Pasc., *A. tardus*, Blackb., &c., in respect of its sculpture but is a much narrower insect than either of those two; it differs from *A. tardus* also in the seriate foveæ of the elytra not being coloured differently from the general surface. The foveæ of the series are somewhat uniform in size, but those in the middle part of the series near the lateral margins are a little larger than the rest. In a series (say the 4th from the suture exclusive of the short scutellar series) there are about twenty foveæ between the base and the part of the elytra where the middle series cease or become mixed with other series; the intervals between fovea and fovea in the series are much less than the diameter of the foveæ and the interstices between the series are about as wide as the diameter of a fovea. The sculpture of the elytra is much like that of *Chalcopterus catenulatus*, Blackb.

N. Queensland; sent by C. French, Esq.

A. STOLIDUS, sp.nov.

Ovalis; nitidus; niger, corpore subtus rufescenti, antennis pedibusque rufo-testaceis; antennis (colore excepto) oculis et capite toto fere ut *A. ægri* sed clypeo a fronte sutura minus sulciformi diviso, oculis paullo magis remotis, antennarum articulo 3° paullo minus elongato, prothorace (colore nitoreque exceptis) fere ut *A. ægri* sed paullo (nec multo) magis transverso, angulis anticis paullo minus posticis paullo magis obtusis; elytris subgrosse seriatim punctulatis, puncturis in seriebus irregulariter (hic magis, illic minus, crebre) dispositis; interstitiis subtilissime punctulatis inæqualiter convexis; prosterno medio leviter convexo; corpore subtus subtilissime punctulato; femoribus anticis antice subtilissime punctulatis; tarsorum posticorum articulo basali quam ceteri conjuncti sublongiori. [Long. $3\frac{1}{2}$, lat. $1\frac{3}{5}$ lines.

A very nitid species of black colour, with the legs and antennæ clear rufous and the undersurface a little inclining to a reddish tone. The elytra have an uneven appearance owing to the punctures in the series (which are evidently larger than those of *A. æger* and considerably less coarse than those of *A. porosus)* being less closely placed in some than in other parts, and the interstices being here and there very evidently convex. There is no real striation, although in places the convexity of the interstices gives a slight appearance of it. The front tibiæ in the male are strongly arched and strongly dilated at the apex.

N. S. Wales; Sydney; Mr. Lea, &c.

A. LILLIPUTANUS, sp.nov.

Ovalis; nitidus; niger, corpore subtus rufescenti, antennis pedibusque rufo-testaceis; capite crebre æqualiter sat subtiliter punctulato supra antennarum basin parum reflexo; oculis quam antennarum articuli basalis longitudine vix magis inter se remotis; sulcis ocularibus nullis; antennis quam corporis dimidium sat brevioribus, apicem versus manifeste incrassatis, articulo 3° quam 5^{us} multo longiori; prothorace quam longiori duplo (postice quam antice duabus partibus) latiori, crebre subtiliter punctulato, antice sinuatim fere truncato, a basi antrorsum arcuatim angustato, basi media sublobata, angulis obtusis; elytris sat subtiliter seriatim punctulatis, puncturis in seriebus vix crebre positis, interstitiis planis perspicue punctulatis; prosterno medio subplanato; abdomine subfortiter nec crebre punctulato; femoribus anticis antice vix perspicue punctulatis; tarsorum posticorum articulo basali ceteris conjunctis longitudine æquali. [Long. 2, lat. 1 line.

Its very small size separates this species from all previously described except *A. minutus*, Pasc., the elytra of which are said to be strongly striate-punctate, those of the present insect not being distinctly striate at all. It is a good deal like *A. stolidus* in general appearance, but differs *inter alia* in its eyes being much less widely separated from each other, the much finer punctures of its elytral series, and the comparatively strong and sparse puncturation of its abdomen. The last of these characters distinguishes it from nearly all its congeners. The specimens I have seen appear to be females; probably the male has its front tibiæ arched and at the apex dilated.

Queensland; Wide Bay; sent by Mr. Masters.

A. RUTILIPES, sp.nov.

Ovalis; sat elongatus; modice nitidus; corpore subtus capite prothoraceque plus minus rufescentibus, elytris piceo-nigris, antennis pedibusque testaceo-rufis; capite prothoraceque crebre sat fortiter punctulatis; illo supra antennarum basin modice reflexo; oculis quam antennarum articuli basalis longitudine paullo magis inter se remotis; sulcis ocularibus nullis; antennis quam corporis dimidium vix longioribus, apicem versus haud incrassatis, articulo 3° quam 5^{us} manifeste longiori; prothorace quam longiori (et postice quam antice) fere duplo latiori, antice sinuatim leviter emarginato, a basi antrorsum arcuatim angustato, basi media manifeste lobata, angulis anticis acutis posticis obtusis; elytris fortiter punctulato-striatis, interstitiis sat convexis manifeste punctulatis; prosterno medio antice concavo; metasterno medio manifeste nec crebre nec fortiter, abdomine antice magis fortiter magis crebre, punctulatis; femoribus anticis antice manifeste punctulatis; tarsorum posticorum articulo basali quam ceteri conjuncti paullo breviori.

[Long. 3, lat. $1\frac{2}{5}$ lines.

This species seems to be near *A. minutus*, Pasc., which however is described as much smaller (long. $2\frac{1}{4}$ lines) and as having its prothorax "finely" punctured; the prothorax of the present insect is more strongly sculptured than in almost any other *Amarygmus* that I have seen.

A. QUEENSLANDICUS, sp.nov.

Ovalis; supra minus, subtus magis, nitidus; niger, elytris obscure cyaneis, tarsis rufis; capite sat crebre sat subtiliter punctulato, supra antennarum basin modice reflexo; oculis quam antennarum articuli basalis longitudine vix magis inter se remotis; sulcis ocularibus nullis; antennis quam corporis dimidium haud multo brevioribus, apicem versus parum incrassatis, articulo 3° quam 5^{us} multo longiori; prothorace quam longiori tribus partibus (postice quam antice circiter duabus partibus) latiori, perspicue sat crebre punctulato, antice emarginato, a basi antrorsum arcuatim angustato, basi media sublobata, angulis bene determinatis obtusis (anticis subacuminatis); elytris fortiter striatis, striis punctulatis (vel potius lateraliter crenulatis), interstitiis sat convexis (postice

subcarinuliformibus) vix manifeste punctulatis; prosterno medio sulcato; corpore subtus vix perspicue punctulato; femoribus anticis antice subtiliter punctulatis; tarsorum posticorum articulo basali ceteris conjunctis longitudine æquali. [Long. $3\frac{3}{5}$, lat. $1\frac{4}{5}$ lines.

Extremely like *A. striatus*, Macl., but differing from it by its smaller size, the dark blue colour of its elytra, its narrower form, slightly narrower interval between the eyes, more distinct punctuation of the prothorax, greater convexity of the elytral interstices behind, and decidedly more nitid appearance, especially on the undersurface which is quite brightly polished.

N. Queensland; sent by C. French, Esq.

A. PINGUIS, sp.nov.

A. queenslandico valde affinis; sat breviter ovalis (corporis dimidio quam antennæ sat breviori); oculis quam antennarum articuli basalis longitudine sat multo magis inter se remotis; elytrorum inter strias interstitiis postice fortiter sat anguste convexis (sat fortiter carinatis); cetera ut *A. queenslandici*. [Long. $2\frac{4}{5}$, lat. $1\frac{3}{5}$ lines.

This species is another close ally of *A. striatus*, Macl., and still closer of *A. queenslandicus*. It is, however, clearly distinct from both, being much smaller, with outline nearer that of *striatus* but with the sides decidedly more rounded. In *A. striatus* the elytral interstices are of almost even convexity throughout (only *narrowing* somewhat near the apex), but in *A. pinguis* their convexity becomes greater hindward so that in front they are gently convex and somewhat wide, and behind change into a keel-like and much narrower form.

N, Queensland; Endeavour R.; sent by Mr. Masters.

A. PERPLEXUS, sp.nov.

A. queenslandico valde affinis; sat breviter ovalis (corporis dimidio antennis longitudine sat æquali); elytris nigris; sulcis ocularibus sat manifestis; prothoracis lateribus magis rotundatis; elytrorum interstitiis minus convexis. [Long. 3, lat. $1\frac{4}{5}$ lines.

Another member of the group of *A. striatus*, Macl., [consisting of species distinguished by the elytra having very strong striæ which are only feebly punctured, or rather laterally crenulate (the crenulations obsolete near the apex)]. It is very much smaller than *striatus*, and smaller and of much more widely oval form than *queenslandicus.* From *pinguis* it differs by the interstices of its elytra being much less convex, and from *diaperioides*, Blackb., (P.L.S.N.S.W. 1888, p. 1435), by the interstices not being punctulate. From all the abovementioned species it differs by the presence of distinctly traceable ocular sulci.

N. Territory of S. Australia; sent by G. Masters, Esq.

A. RIMOSUS, sp.nov.

Elongatus; sat parallelus, sat nitidus; niger, elytris orichalceis purpureo-foveatis, antennis pedibusque rufis; capite sat subtiliter nec crebre punctulato, supra antennarum basin parum reflexo; oculis quam antennarum articuli basalis longitudine magis inter se remotis; sulcis ocularibus profundis, ante oculos positis; antennis quam corporis dimidium multo brevioribus apicem versus sat fortiter incrassatis, articulo 3° quam 5^{us} multo longiori; prothorace minus convexo, quam longiori fere duplo (postice quam antice duabus partibus) latiori, crebre subfortiter punctulato, antice leviter sinuatim emarginato, a basi antrorsum subarcuatim angustato, basi media sat anguste sublobata, angulis bene determinatis; elytris seriatim foveolatis, foveolis inæqualibus (nonnullis elongato-sulciformibus), interstitiis planis sparsim subtiliter punctulatis; prosterno medio antice carinato; metasterno et abdomine antice in medio sat fortiter punctulatis; tarsorum posticorum articulo basali quam ceteri conjuncti paullo breviori. [Long. 5-5½, lat. 2½-2⅗ lines.

This very distinct and remarkably fine species may be at once distinguished from all its congeners by the unusual sculpture of its elytra, many of the seriate punctures taking the form of long deep sulci. It is allied to *A. variolaris*, Pasc.

N. S. Wales; Richmond R. district; sent by Mr. Masters and Mr. Lea.

A. LINDENSIS, sp.nov.

Elongato-ovalis; nitidus; rufo-piceus, prothorace nigro, elytris obscure viridibus seriatim purpureo-foveolatis; capite toto (exempli typici) in prothorace abdito; antennis ut *A. rimosi* sed minus robustis et apicem versus minus incrassatis; prothorace ut *A. rimosi* sed magis convexo; elytris seriatim subfoveolatis, foveolis rotundatis inæqualibus, interstitiis planis crebre subtiliter punctulatis; prosterno medio sulcato; metasterno toto (epipleuris inclusis) sparsim subfortiter punctulato; abdomine vix manifeste punctulato; tarsorum posticorum articulo basali quam ceteri conjuncti vix breviori. [Long. 3½, lat. 1⅘ lines.

This is another ally of *A. variolaris*, Pasc., differing from it *inter alia* by the seriate punctures on its elytra being distinctly smaller, much more numerous and placed in perfectly regular longitudinal series, also by its much more nitid and differently coloured upper surface. The seriate punctures on the elytra are scarcely large enough to be called *foveæ;* they are of about the same size as those of *A. stolidus*, Blackb. The sculpture of the metasternum distinguishes this species from all its described allies.

S. Australia; near Port Lincoln.

A. RUGATICOLLIS, sp.nov.

Oblongo-ovalis; subopacus; niger, antennis tarsisque rufo-piceis; capite crebre subaspere punctulato supra antennarum basin modice reflexo; oculis quam antennarum articuli basalis longitudine vix magis inter se remotis; sulcis ocularibus nullis; antennis quam corporis dimidium paullo longioribus, apicem versus vix incrassatis, articulo 3° quam 5^{us} sat longiori; prothorace quam longiori (et postice quam antice) fere duplo latiori, longitudinaliter confertim subfortiter rugato, antice sinuatim emarginato, ad latera sat rotundato, basi media distincte lobata, angulis anticis acutis subproductis posticis obtusis bene determinatis; elytris sat fortiter punctulato-striatis, interstitiis leviter convexis obsolete punctulatis; prosterno medio late concavo; corpore subtus vix perspicue punctulato, leviter rugato; tarsorum posticorum articulo basali ceteris conjunctis subæquali. [Long. 3, lat. 1½ lines.

This species may be at once distinguished from its congeners known to me by the very conspicuous and remarkable sculpture of its prothorax, consisting of close strong more or less longitudinal wrinkles or striæ. It has been sent to me on what I cannot but admit to be valuable authority as *A. maurulus*, Pasc. I cannot however think it can be that insect seeing that Mr. Pascoe calls its prothorax "impunctate" and says nothing about any strigæ on that segment. I have seen many specimens of this species, all quite identical.

N. S. Wales; apparently widely distributed.

The following are the species of *Amarygmus* described since the publication of Mr. Masters' Catalogue of Coleoptera and before the date of this revision.

A. DIAPERIOIDES, Blackb., P.L.S.N.S.W. 1888, p. 1435.

A. TARDUS, Blackb., loc. cit. 1889, p. 1271.

A. UNIFORMIS, Blackb., loc. cit. 1889, p. 1272.

N.B.—The insect of which the following is a description has been received while this memoir was in the press, and therefore can be noticed only as an addendum.

A. TASMANICUS (? var. *uniformis*, Blackb.).

A. uniformi, Blackb., valde affinis; differt magnitudine majori, colore obscure viridi (nullo modo æneo). Long. 7, lat. 3⅗ lines.

This is an extremely puzzling species owing to its great resemblance to *A. uniformis* (from N. Queensland). A careful comparison with the type of the latter has failed to reveal any very satisfactory character to distinguish it; nevertheless, its considerably greater size and very different colour, together with the great distance from Queensland of its habitat, point to the probability that the study of more examples might prove it to be distinct. In any case it seems well to give it a name. I may add that I have seen a good many examples of *A. uniformis* from Queensland, and that they show no tendency to variation.

Clarke Island, Tasmania; sent by C. French, Esq.

SYNONYMY OF AND REMARKS ON OLD-DESCRIBED AUSTRALIAN MOLLUSCA, WITH NOTES ON THEIR DISTRIBUTION.

By John Brazier, F.L.S., C.M.Z.S., &c.

In the year 1854 Mr. William Swainson, in the Proceedings of the Royal Society of Van Diemen's Land (Vol. iii. p. 38, pl. vi. figs. 1, 2), defined and described a new genus and species of *Trochidæ*, discovered by Dr. Milligan on the east coast of that island; he defined the genus as *Astele*, and he says that on a cursory glance it has every appearance of belonging to the beautiful genus *Calliostoma* (Treatise on Malacology, p. 351, 1840).

The genus may thus be defined from its shell:—

Astele, Swainson, 1854.

"*Animal* unknown. *Shell* perlaceous; pyramidical or trochiform; unarmed, body whorl beneath convex. *Columella* none. *Umbilicus* large, closed only by the terminal whorl of the spire. *Aperture* broader than high, the margin of both lips thin."

Astele subcarinata, Swainson, 1854.

"Shell broader than high; whorls above scarcely convex; marked by 6-7 elevated, smooth, convex striæ, which leave a flattened margined rim at the top of each whorl; body whorl beneath marked with concentric grooves, which are decussated near the umbilicus."

"Colour pale fawn, or isabella, clouded with faint transverse waves of rufous."

"Margin of the body whorl slightly carinated; there is a depression between the margin and the second elevated striæ on the upper surface, the first, or that next the margin, being very slender. The striæ beneath assume the appearance of grooves, which are wider apart as they approach the umbilicus; and the three more immediately adjoining are crossed by transverse striæ, which produces a granulated appearance somewhat similar to that of *Solarium perspectivum.*"

"There are no longitudinal striæ, however slight, on the surface. The umbilicus is pure white, and the inner surface of the aperture reflects the striæ on the upper surface."

Nine years after its description by Swainson, Mr. Arthur Adams comes to the front with another new generic and specific name in the Proceedings of the Zoological Society of London, 1863, p. 506, as *Eutrochus*, with the specific name of *perspectivus.*

EUTROCHUS, A. Adams, 1863.

"*Testa trochiformis, tenuis, perspective umbilicata; anfractibus planis, transversim liratis. Apertura subquadrata, intus margaritacea, labio rectiusculo, margine acuto, subreflexo, antice in dentem obtusum desinente.*"

"A form of *Trochidæ* most nearly resembling a *Ziziphinus*, with a perspective umbilicus similar to that of *Architectonica.*"

EUTROCHUS PERSPECTIVUS, A. Adams, 1863.

"E. testa depresso-conoidea, late et profunde umbilicata, pallide carnicolore, fulvo sparsim maculata et flammulis fulvicantibus picta; anfractibus 7, planis, transversim valde liratis, liris inæqualibus subdistantibus, ad suturas angulatis, anfractu ultimo ad periomphalum granuloso; apertura intus sulcata."

"Alt. 1 in., lat. 1½ in.

"The shell is broader than high, rather thin, and of a pale yellowish flesh-colour, with fulvous blotches and flammules. The whorls are transversely ridged and angulate at the sutures, and the interior of the umbilicus is white. Mr. Cuming possesses but a single specimen from Tasmania."

Type in British Museum.

My esteemed friend Mr. H. A. Pilsbry could never have seen the Proc. Royal Soc. Van Diemen's Land, 1854, Vol. iii.; for if he had I am quite sure he would have given Swainson's genus and species credit, and not A. Adams' *Eutrochus.* The only mention of Swainson's *umbilicated* species of *Trochus* is by Mr.

Pilsbry in Tryon's Manual of Conchology, Vol. x. p. 231, 1888; but then he is only quoting from Tenison-Woods (Proc. Royal Soc. Tasmania, p. 39, 1877).

There is no mention whatever of *Astele* in Tryon, (*Trochidæ*, Vol. xi. 1889, by Mr. H. A. Pilsbry), the latest work out on the subject.

Pilsbry changes A. Adams' specific name from *perspectivus* to *Adamsi*, the former name being used by Koch also for an *Astele* = *Eutrochus;* he also says—"I hesitate to change the name of this the typical species of *Eutrochus*, but it is preoccupied by an undoubtedly congeneric species described years before."

I like to give honour to whom honour is due, and that is to Swainson; the synonymy will stand as below:—

1. Astele subcarinata, Swainson, sp.

1854. *Astele subcarinata*, Swainson, Proc. Roy. Soc. of Van Diemen's Land,* Vol. iii. p. 36, pl. 6, figs. 1-2.

1863. *Eutrochus perspectivus*, A. Adams, Proc. Zool. Soc. p. 506.

1877. *Astele subcarinatus*, Tenison-Woods, Proc. Roy. Soc. Tasmania, p. 39.

1889. *Calliostoma (Eutrochus) Adamsi*, Pilsbry in Tryon's Manual of Conchology, Vol. xi. p. 402.

Hab.—East coast of Tasmania *(Dr. Milligan);* Tasmania *(Cuming);* Circular Head, North coast of Tasmania *(Brazier);* Rocky Cape, near Circular Head *(Miss Mary Lodder);* Port Sorell, North coast of Tasmania *(Mrs. Dumbelton).*

Of this very rare shell I know of only two specimens in this country, one in the collection of Dr. J. C. Cox and one that has been in my own this past thirty years. Tenison-Woods remarks that only very few specimens have ever been found.

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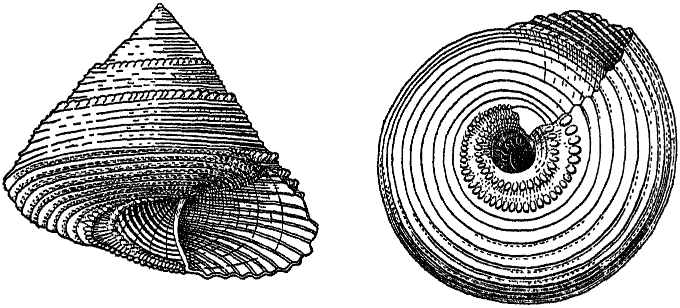
* Name of Van Diemen's Land altered to Tasmania on Address of Legislative Council, 1854

The measurements of the specimen I now figure are: greatest height 34; least, 28; greatest breadth, 47; least, 40; aperture wide, 17; height, 12 millimetres.



(C. H. del.)

The other species of Australian *Astele* are *scitula*, A. Adams, originally described as coming from New Zealand on the authority of Cuming; the original specimens were, however, collected by the late Mr. Fred. Strange in Port Jackson: *Astele multigrana*, Dunker, from St. Vincent's Gulf, South Australia; *Astele subgranulata*, Dunker, Bass Straits; and *Astele Lessonæana*, Tapparone-Canefri, New Zealand (Mus. of Turin).

2. TURBO GRUNERI, Philippi, sp.

1846. *Turbo Gruneri*, Philippi, Zeitschrift für Malakozoologie, p. 98, No. 6; Philippi in Martini and Chemnitz, Conch. Cab. 2nd edition, p. 52, pl. 12, fig. 7.

1848. *Turbo circularis*, Reeve, Conch. Icon. Vol. iv. pl. 10, sp. 46.

1854. *Senectus circularis*, Reeve; H. and A. Adams, Recent Mollusca, Vol. i. p. 392.

1865. *Senectus circularis*, Reeve; Angas, Marine Molluscan Fauna of the Province of South Australia, Proc. Zool. Soc. p. 177.

1873. *Turbo circularis*, Reeve; Fischer in Kiener, Coq. Vivantes, p. 99, pl. 42, fig. 1.

1873. *Turbo (Senectus) circularis*, Reeve; Paetel, Catalog der Conch.-Sammlung. p. 71.

1877. *Turbo (Senectus) circularis*, Reeve; Tenison-Woods, Papers and Proc. Royal Soc. Tasmania, p. 38.

1885. *Turbo circularis*, Reeve; Sowerby, Thes. Conch. Vol. v. p. 203, sp. 42, pl. 4; Thes. pl. 496, fig. 37.

1886. *Turbo Gruneri*, Philippi; Brazier, Transactions of the Royal Society of South Australia, Vol. ix. p. 125.

1888. *Turbo circularis*, Reeve; Pilsbry in Tryon's Manual of Conchology, Vol. x. p. 214, pl. 41, fig. 24.

Hab.—Adelaide, New Holland *(Gruner, Philippi)*; "——"? *(Reeve)*; St. Vincent's Gulf, South Australia *(G. F. Angas)*; Holdfast Bay *(W. T. Bednall, Tate)*; King's Island, Bass Strait *(Tenison-Woods)*; Swan River, Australia *(Sowerby)*.

I pointed out in the Transactions of the Royal Society of South Australia in 1886 that *Turbo Gruneri*, Philippi, had two years' priority over Reeve's *Turbo circularis*; but in 1888 Mr. Pilsbry in Tryon's Manual informs the conchological world that there is some uncertainty about which of the above names has priority for this species. "The volume of the Conchylien Cabinet in which Philippi's description occurs bears date 1846; but it was not completed until after the publication of Reeve's monograph of *Turbo* in the Iconica. Philippi begins to cite Reeve in his synonymy on p. 69 of his work, so that from that point onward we may be certain that his work appeared subsequent to Reeve's, but whether his description of *T. Gruneri* (p. 52 of the Conch. Cab.) was actually published before Reeve's description I am unable to decide. Brazier (Trans. Roy. Soc. S. Australia, ix. p. 125) gives priority to *Gruneri*, 'Philippi in Zeitschrift für Malak., p. 98.' The species was never published in the Zeitschrift."

It seems very strange that Mr. Pilsbry should make the above charge, when he quotes *Turbo lamellosus*, Philippi, in his index to *Turbo* (Vol. x. of Tryon's Manual), that species being described in the Zeitschrift für Malakozoologie, p. 98, No. 7, 1846, just under *Turbo Gruneri*, Philippi.

I may mention that *Turbo lamellosus*, Philippi, is not the *Turbo lamellosus*, Broderip, which is the *Turbo stamineus*, Martyn.

Philippi changed his name to *Turbo foliaceus* in the Conch Cab. 2nd edition, p. 41, pl. 11, figs. 1-2, 1846, (not figures 2 and 3 as quoted in Tryon).

3. TURBO (MARMOROSTOMA) UNDULATUS, Martyn.

1784. *Limax undulatus,* Martyn, Universal Conchologist, Vol. i. fig. 29.
1786. *Limax anguis,* Martyn, Universal Conchologist, Vol. ii. fig. 70.
1788. *Turbo undulatus,* Chemnitz, Conch. Cab. Vol. x. pp. 294-296, pl. 169, figs. 1640, 1641.
1846. *Turbo anguis,* Martyn; Philippi in Conch. Cab. p. 70, No. 34.
1848. *Turbo undulatus,* Chemnitz; Reeve, Conch. Icon. Vol. iv. pl. 1, fig. 3, a, b.
1867. *Lunella undulata,* Chemnitz; Angas, List of Marine Mollusca found in Port Jackson Harbour, Proc. Zool. Soc. p. 213, No. 171.
1888. *Turbo undulatus,* Martyn; Pilsbry in Tryon's Manual of Conchology, Vol. x. p. 216, pl. 42, fig. 40.
1888. *Turbo anguis,* Martyn; Pilsbry in Tryon's Manual of Conchology, Vol. x. Index, p. 272, = *Turbo porphyrites,* Martyn.

Hab.—New Holland, New South Wales *(Martyn)*; Port Jackson, Newcastle, Port Stephens, Bellinger River, and the whole south coast of New South Wales; Tasmania; Victoria; South Australia.

When this species was first figured by Martyn, the large specimens he called *Limax undulatus,* from their peculiar undulating markings. The small specimens from New South Wales he called *Limax anguis.* This small variety is the most common form found at Botany Bay, where, no doubt, Banks and Solander collected the specimen figured by Martyn; it is also the common form found in Port Jackson near the Heads. Philippi in the Conch. Cab. calls this small form, variety *sulcata* of *undulatus.*

It is evidently an oversight on the part of Mr. Pilsbry when he makes *anguis*, Martyn, = *T. porphyrites*, Martyn; he might just as well say that *T. undulatus*, Martyn, = *T. porphyrites*; but the specific differences are very widely distinct, and the species is not found in New Zealand as he quotes it.

"Dr. Solander in the Catalogue of the Portland Museum, 1784: No. 408—A large and fine *Turbo undulatus* from New Holland, extremely scarce; No. 3828—A large and very fine *Turbo undulatus*, or waved Emerald *Turbo*, extremely scarce, from Van Diemen's Land, New Holland."

4. MUREX (CHICOREUS) AUSTRALIS, Quoy and Gaimard.

1811. *Triplex* frondosa *~~ponderosa~~*, Perry, Conchology, or the Natural History of Shells, pl. 6, fig. 1.

1832. *Murex australis*, Quoy et Gaimard, Voyage de "l'Astrolabe," Tome ii. p. 536.

1840. *Murex palmiferus*, Sowerby, Proc. Zool. Soc. p. 142; Conchological Illustrations, species 43, fig. 104.

1845. *Murex palmiferus*, Reeve, Conch. Icon. Vol. iii. pl. 4, fig. 20.

1858. *Murex (Chicoreus) palmiferus*, H. and A. Adams, Genera of Recent Mollusca, Vol. i. part 3, p. 72.

1867. *Murex (Chicoreus) palmiferus*, Angas, Proc. Zool. Soc. p. 186, No. 6.

1875. *Murex (Chichoreus) palmiferus*, Tapparone-Canefri, Muricidi del Mar Rosso, Annali del Museo Civico di Storia Naturale di Genova, Vol. vii. p. 580.

1876. *Murex palmiferus*, Kobelt, Die Muriciden des rothen Meeres, Jahrb. d. deutsch. Malak. Gesellsch. Bd. iii. p. 42, No. 14.

1877. *Murex (Chicoreus) palmiferus*, Kobelt, Catalog der Gattung Murex in Jahrb. d. deutsch. Malak. Gesellsch. Bd. iv. p. 150, No. 55.

1879. *Murex palmiferus*, Sowerby, Thes. Conch. Vol. iv. p. 18, No. 84, pl. 4, Murex, fig. 41.

1880. *Murex (Tribulus) australis*, Tryon, Manual of Conchology, Vol. ii. p. 83.

1880. *Murex (Chicoreus) palmiferus*, Tryon, Manual of Conchology, Vol. ii. p. 90, pl. 14, fig. 146 ; Tapparone-Canefri, La Fauna Malacologique d. l'ile Maurice, Annales de la Société Malacologique de Belgique, Tome xv. (Deuxième Série, Tome v.), p. 10.

1882. *Murex (Chicoreus) australis*, Poirier, Revision des Murex du Muséum, Nouvelles Archives du Muséum D'Histoire Naturelle, Deuxième Série, Tome v. p. 32, No. 4.

1886. *Murex (Chicoreus) palmiferus*, Watson, Report on the Gasteropoda, Voyage of H.M.S. "Challenger," Zoology, Vol. xv. p. 155.

1889. *Murex palmiferus*, Sowerby; Whitelegge, List of the Marine and Fresh-Water Invertebrate Fauna of Port Jackson and Neighbourhood, Journal and Proceedings of the Royal Society of New South Wales, Vol. xxiii. p. 246, No. 208.

Hab.—Port Western, New Holland *(Quoy et Gaimard,* 1829) ; Sydney *(Dutailly)* ; New Holland *(M. J. Verreaux,* 1846) ; New Caledonia *(M. Deshayes,* 1879) ; Red Sea *(Sowerby,* 1840) ; North Australia *(Reeve,* 1845) ; between Ball's Head and Goat Island, 18 fathoms, bottom broken shells, stones, and gravel ; Point Piper, Middle Harbour, Watson's Bay, under stones at low water, spring tides ; Cape Solander, South Head, and Cape Banks, North Head, of Botany Bay ; South Head of Crookhaven River, Shoal, haven, found under stones low water, springs ; Montague Roads-Jervis Bay, near the rocks in 5 fathoms ; Nelson Head and Bay, Port Stephens, New South Wales, under stones low water, spring tides *(J. Brazier,* 1854, 1893) ; Woolloomooloo Bay *(G. F. Angas)* ; Neutral Bay, Port Jackson *(T. Whitelegge)* ; Yeppoon, Keppell Bay, Queensland *(George L. Pilcher,* 1887) ; Largs Bay, South Australia *(Arnold U. Henn,* 1891).

I have not seen this species further south of Sydney than Jervis Bay, where I dredged specimens on October 31, 1874. The specimens said to be obtained by Quoy and Gaimard at Port Western, New Holland (now Victoria), may have been dredged by them. I had not seen any species like it from Southern Australia until quite recently, when two specimens were obtained from shell débris by my friend Mr. Arnold U. Henn at Largs Bay, South Australia, in November, 1891.

I quote Mons. M. J. Poirier, from the Nouvelles Archives du Muséum D'Histoire Naturelle, p. 65:—"This species, of Quoy and Gaimard, misunderstood by all authors, has nearly the same geographical range as *M. corrugatus,* Sowerby, with which, besides, it has many analogies. It has been remarked on the northern coasts of Australia and in the Red Sea. It is represented by twelve individuals coming from Port Western (the types of Quoy and Gaimard, 1829), from Sydney (Coll. Dutailly), from New Holland (M. J. Verreaux, 1846), and from New Caledonia (M. Deshayes, 1874). The *M. australis,* Quoy and G., not figured in the atlas of the Voyage of the 'Astrolabe,' has been lost in forgetfulness by the various writers who have dealt with the genus *Murex.* Tryon alone admits it, but without recognising its affinities, and he places it among the group of Tribulus. An examination of the types preserved in the collection of the Museum* has shown me that this species is no other than that described by Sowerby under the name of *M. palmiferus.* This denomination being the latest ought then to pass into the synonymy."

The Rev. Boog Watson, in his Report on the Gasteropoda of H.M.S. "Challenger," Zoology, Vol. xv. p. 155, appears to have followed Mr. Tryon in lumping *M. palmiferus,* Sowerby, = *australis,* Quoy and G., with three distinct and well-known species, namely, *Murex corrugatus,* Sowerby, *Murex multifrondosus,* Sowerby, and *Murex dilectus,* A. Adams.

The word *Chicoreus* is spelt in three different ways by three authors, namely *Chicoreus,* Montfort, 1810; *Chichoreus,* Tapparone-Canefri, 1874; *Cichoreus,* E. v. Martens, 1880.

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* Museum of the Jardin des Plantes, Paris.

5. MUREX (PHYLLONOTUS) UMBILICATUS, Tenison-Woods.

1853. *Murex scalaris*, A. Adams (non Brocchi), Proc. Zool. Soc. London, p. 71.

1865. *Murex scalaris*, Angas (non Brocchi), Marine Molluscan Fauna of South Australia, Proc. Zool. Soc. London, p. 157, No. 5.

1875. *Trophon umbilicatus*, Tenison-Woods, Papers and Proceedings of the Royal Society of Tasmania, p. 135, 1875, 1876.

1876. *Murex (Muricidea) scalaris*, Brazier (non Brocchi), "Chevert" Expedition, Shells, Proc. Linn. Soc. New South Wales, Vol. i. p. 172, No. 13, 1875, 1877.

1877. *Trophon umbilicatus*, Tenison-Woods, Census, with brief descriptions of the Marine Shells of Tasmania and the adjacent islands; Papers and Proceedings of the Royal Society of Tasmania, p. 26, 1877, 1878.

1877. *Murex (Ocinebra) scalaris*, Kobelt (non Brocchi), Jahrb. d. deutsch. Malak. Gesellsch. Bd. iv. p. 248, No. 227.

1880. *Murex (Phyllonotus) Angasi*, Tryon (non Crosse), Manual of Conchology, Vol. ii. p. 109.

1884. *Murex (Phyllonotus) octogonus*, Bednall (non Quoy and Gaimard), Transactions and Proceedings and Reports of the Royal Society of South Australia, Vol. viii. p. 64, 1884, 1885 (issued May, 1886).

Hab.—Moreton Bay, Queensland *(Mr. F. Strange)*; St. Vincent's Gulf, South Australia, "dredged along with horny zoophytes and nullipores at a depth of seven or eight fathoms" *(Angas, Tate, Bednall)*; Darnley Island, Torres Straits, 30 fathoms, sandy bottom *(J. Brazier*, "Chevert" Expedition, 1875); Barran Island, Bass' Strait *(Mr. W. Legrand*, 1873); Giles' Point, near Coobowie, St. Vincent's Gulf, off the rocks below low water mark *(Mr. E. H. Matthews*, 1891); Trowbridge Island, St. Vincent's Gulf, off the beach, also dredged in life from 4 to 10 fathoms; fair specimens from Hardwicke Bay, Spencer's Gulf *(Mr. E. H. Matthews,* 1892); east coast of Tasmania *(Mr. W. Legrand);* north coast of Tasmania from Port Sorell to a few miles west of the River Leven, specimens generally very much beach-worn *(Miss Mary Lodder,* 1892).

Some years ago I sent home a specimen of this shell that I had received from Mr. Bednall to my respected friend Mr. Henry Adams to know if it was identical with his brother's species *Murex scalaris.* I had already made it out as such from the description given in the Proceedings of the Zoological Society of London, 1853, p. 71. He duly returned the specimen and stated that it was "identical with the *Murex scalaris,* A. Adams (not of Brocchi), in Museum Cuming; the *Murex scalaris* of my brother requires a new name, and if you are working up the genus at any time pray give it a new name."

In 1873 Mr. W. Legrand sent me a beach-worn specimen with the liræ worn off, and on that account I laid it aside and did not take any further notice of it; and on my leaving Sydney for New Guinea in 1875 the Rev. J. E. Tenison-Woods described it in a paper read before the Royal Society of Tasmania, November, 1875, from specimens collected by Mr. Legrand. There is not the slightest connection between *Murex octogonus,* Quoy and G., and *Murex umbilicatus,* Tenison-Woods; the former is a large shell with very fine liræ between the longitudinal lirate ribs, the latter is a much thicker and smaller shell with a large umbilicus margined with rounded imbricated scales.

Swainson in 1835 defined a subgenus of the Muricidæ under the name of *Centronotus,* but he re-named it *Phyllonotus* and *Muricanthus* (1840); the former name *Centronotus* had been previously given to a genus of fishes in 1801 by Bloch, Schn.; Lacepède, 1802.

6. MUREX (OCINEBRA) BRAZIERI, Angas.

1877. *Murex Brazieri,* Angas, Proc. Zool. Soc. p. 171, pl. 26, fig. 3; p. 179, No. 12.

1879. *Murex Brazieri*, Sowerby, Thes. Conch. Vol. iv. p. 42, species 200, Murex, pl. 33, fig. 226 (enlarged).

1880. *Murex (Ocinebra) Brazieri*, Tryon, Manual of Conchology, Vol. ii. p. 132, pl. 30, fig. 289 (very bad).

1882. *Murex (Muricidea) Brazieri*, Poirier, Révision des Murex du Muséum Nouvelles Archives du Museum d'Histoire Naturelle, Deuxième Série, Tome v. p. 104, No. 208.

1884. *Trophon tumidus*, Petterd, Journal of Conchology (England), Vol. iv. part 5, p. 141, No. 26.

1889. *Murex Brazieri*, Whitelegge, List of the Marine and Fresh-Water Invertebrate Fauna of Port Jackson and Neighbourhood, Journal and Proceedings of the Royal Society, New South Wales, Vol. xxiii. p. 246, No. 209.

1889. *Murex Brazieri*, Angas; Brazier, Journal of Conchology, (England), Vol. vi. part 2, p. 66.

Hab.—Dredged outside Port Jackson Heads in 20 fathoms (*J. Brazier*, 1873); off the Bottle and Glass Rocks, Vaucluse, Port Jackson, 8 fathoms, bottom gravel, broken shells, and fine sand (1874); Middle Harbour, found in shell-sand thrown up after south-east gale; South Australia (*W. T. Bednall*); north-west coast of Tasmania (*Miss Mary Lodder*); north side of Long Bay, near Sydney, in shell-sand (*J. Brazier*, July 24, 1886).

This species was sent to me by Mr. Bednall as the young of *Murex pumilus*, A. Adams, the latter species not being found in South Australia, but in China and Darros Island, Amirantes, in 22 fathoms.

The shell known in South Australia as *Murex pumilus*, A. Adams, by Mr. Angas and others, is a new species which I have named *Murex polypleurus*.

Through the kindness of Miss Mary Lodder, of Ulverstone, North Tasmania, in sending for my inspection the type specimen of Mr. Petterd's *Trophon tumidus*, I find that, after comparing it with numerous specimens of *Murex Brazieri*, Angas, they prove to be one and the same species.

7. HELCIONSISCUS TRAMOSERICA, Martyn.

1784. *Patella tramoserica*, Martyn, Universal Conchologist, Vol. i. pl. 16.

1795. *Patella tramoserica*, Martyn; Chemnitz, Conch. Cab. Vol. xi. p. 179, pl. 197, figs. 1912, 1913.

1836. *Patella tramoserica*, Chemnitz; Deshayes in Lamarck Anim. sans Vert. Vol vii. p. 542, No. 47.

1852. *Patella tramoserica*, Chemnitz; Gould, United States Exploring Expedition, Vol. xii. Mollusca and Shells, p. 343.

1854. *Patella tramoserica*, Martyn; Reeve, Conch. Icon. Vol. viii. pl. 13, fig. 27, a, b, c.

1873. *Patella tramoserica*, Martyn; E. v. Martens, Critical List of the Mollusca of New Zealand, contained in European Collections, p. 35.

1877. *Patella tramoserica*, Martyn; Tenison-Woods, Census, with brief Descriptions of the Marine Shells of Tasmania, Proc. Royal Soc. Tasmania, p. 45.

1880. *Patella tramoserica*, Martyn; Hutton, Manual of New Zealand Mollusca, p. 109.

1884. *Patella tramoserica*, Hutton, Proc. Linn. Soc. New South Wales, Vol. ix. p. 377.

1891, 1892. *Helcionsiscus tramoserica*, Pilsbry in Tryon's Manual of Conchology, Vol. xiii. p. 142, pl. 70, figs. 49, 50, 51, 52.

Hab.—New South Wales (*Chemnitz*, from Spengler's Coll.); Wellington, New Zealand (*Hutton*).

For this common species when first figured by Martyn in 1784 he gave the locality "north-west coast of America"; Chemnitz in 1795 was the first to give the correct locality, New South Wales, from Spengler's collection; it was also known as the Orange-striped Limpet from the South Sea by the elder English conchologists; Deshayes in Lamarck in 1836 gives Peru and

Chili; Dr. Gould in United States Exploring Expedition, 1852, gives New Zealand, and states that the "localities hitherto given, Peru and Chili, are probably erroneous"; Dr. E. v. Martens in 1873 says that "Gould corroborates Martyn's statement that it is found also in New Zealand"; Martyn never gave New Zealand or New South Wales, as I have previously said; Professor Hutton in 1880 quotes New Zealand (Martyn and Gould), common in Australia, and this is taken from Martens' Critical List of New Zealand Mollusca, and again in 1884 he gives Wellington, New Zealand, for it, and quotes *Patella antipodum*, E. A. Smith, as being the same; not having seen Mr. Smith's species, I will not at present lump it with *tramoserica*. Mr. Pilsbry in Tryon's Manual, Vol. xiii. p. 142, 1891, 1892, makes *tramoserica* and *antipodum* one species; the figure of the latter in the Zoology of the Voyage of H.M.S. Erebus and Terror, Mollusca, p. 4, pl. 1, fig. 25, is very much like some of the many varieties of *tramoserica*, and I doubt very much if Smith's species was ever found in New Zealand. Dieffenbach and others have made very grave errors in their localities of Australian and New Zealand Mollusca; even authors in some of the recent manuals and monographs quote strictly Australian species from New Zealand and New Ireland; some of them evidently take New Ireland as being near Australia or a part of New Zealand.

To sum up *Helcionsiscus tramoserica* is purely an Australian species there is not the least doubt, it having been found in Tasmania, South Australia, Victoria, the whole coast line of New South Wales, and into Moreton Bay, Queensland; and its varieties are legion, and appear to have escaped the species-maker of the Cuming school.

NOTE ON THE OCCURRENCE OF *LEPIDODENDRON* IN UPPER DEVONIAN ROCKS AT MOUNT LAMBIE, NEAR RYDAL, NEW SOUTH WALES.

By E. F. Pittman, Assoc. R.S.M., and T. W. E. David, B.A., F.G.S.

As far as the authors are aware, the occurrence of *Lepidodendron* in Australia in rocks, for the Devonian Age of which there is strong evidence, has not hitherto been proved. The object of the present note is to show that the result of recent examinations by the authors of the neighbourhood of Mount Lambie in New South Wales proves that a species of *Lepidodendron* occurs there in rocks probably of Upper Devonian Age.

The literature on the subject of *Lepidodendron australe* has been well summarised by Mr. R. Etheridge, jun., in an article contributed to the Records of the Geological Survey of New South Wales.*

According to the above article, William Carruthers published the first description of an Australian *Lepidodendron*, under the name of *L. nothum*, Unger. McCoy next described a species of this genus from the Avon River, Gippsland, Victoria, as *Lepidodendron australe.* Carruthers' specimens were forwarded by the late R. Daintree from Mount Wyatt, Canoona, and the Broken River, in Queensland, and were considered by him to be of Old Red Sandstone Age.

Mr. Etheridge gives the age of the Avon River Sandstones as Lower Carboniferous, but Mr. R. A. F. Murray, in his "Geology and Physical Geography of Victoria,"† classes the Avon River

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* Records Geological Survey of New South Wales, Vol. ii. Part 3, p. 119.

† Geology and Physical Geography of Victoria, p. 78.

Sandstones as Upper Devonian, admitting, however, that there is an immense unconformability between them and the Middle Devonian Rocks, the latter being nearly vertical in places where the former are nearly horizontal.

On page 67 *(loc. cit.)* Mr. Murray states:—"It is highly probable, therefore, judging from their stratigraphical position, that the Avon Sandstones are—as indicated by Professor McCoy on palæontological evidence—of Lower Carboniferous Age, or passage beds in that direction upwards from the Upper Devonian beds."

Mr. Etheridge contends that Carruthers' specimens, so-called *L. nothum*, and McCoy's *L. australe* are identical, and should therefore both be termed *L. australe.* Professor McCoy has indicated that there is a close relation between *L. australe* and *L. tetragonum*, Sternb., of the European Carboniferous.

Mr. R. Daintree has stated that in Queensland strata yielding *Lepidodendron* at Mt. Wyatt are interstratified with *Spirifera disjuncta* beds; no detailed description or figure, however, is given of these Spirifers.

The Rev. W. B. Clarke states: "So far as *Lepidodendron* is concerned, that plant occurs in some places in association with beds that are decidedly younger than any called Devonian; near Pallal, on the Horton River, and on the Manilla River, in Liverpool Plains, ... and at Goonoo Goonoo, on the Peel River, in New South Wales, it occurs in fine grey sandstone with ferns and *Sigillaria*, in close proximity to beds of marine fossils, which are certainly Lower Carboniferous."

This conclusion is quite in accord with the evidence collected by Mr. J. Mackenzie, F.G.S., the Government Examiner of Coal-Fields, who showed Mr. Etheridge and one of the authors about three years ago a slab of rock obtained by him *in situ* in the Stroud district, showing a species of *Lepidodendron* associated with an undoubted Carboniferous marine fauna. At the Great Star River also, in Queensland, we have the authority of Mr. Jack and Mr. Etheridge for stating that *Lepidodendron* is there associated with a Carboniferous fauna.

Mr. Etheridge, at the conclusion of his able article on *Lepidodendron australe*, states that at Mt. Lambie there appears to be an insensible gradation, so far as our present knowledge shows, from beds of Upper Devonian Age into those of Lower Carboniferous, as in Victoria. His conclusions, if summarised, amount to this—that *Lepidodendron australe* is undoubtedly of Carboniferous Age in some parts of Queensland and New South Wales. In Victoria it is probably Lower Carboniferous in the Avon River Sandstones, and at Mt. Lambie in New South Wales and Mt. Wyatt in Queensland, probably Carboniferous, possibly Devonian, but of the latter Age at the time when he wrote there was no absolute proof.

Mr. Clunies Ross, B.Sc., of Bathurst, in a paper read before the Hobart Meeting of the Australasian Association for the Advancement of Science, summarising our knowledge of *Lepidodendron* in New South Wales, stated that *L. Volkmannianum* and *L. Veltheimianum* were probably of Carboniferous Age in Eastern Australia, but that, while admitting that *L. australe* was, at some of the localities where it was known to occur, of Carboniferous Age, he considered that, in the neighbourhood of Bathurst, at any rate, it was probably Devonian. This latter conclusion was based on the evidence collected by himself at a locality 16 miles from Bathurst, where he had discovered a drift piece of *Lepidodendron* under circumstances which led him to the conclusion that it had probably been derived from a geological horizon below that of the marine Devonian brachiopoda of that locality.

With a view of trying to set at rest the important question as to whether *Lepidodendron* descends into true Devonian rocks in Australia, the authors recently spent four days in exploring the country in the neighbourhood of Mt. Lambie. For the first two days not a single specimen of *Lepidodendron* could be discovered, but on the third day about twenty specimens of *Lepidodendron australe* were discovered by us *in situ* near to the locality where similar specimens had been previously obtained by the Rev. W. B. Clarke and the late Government Geologist, Mr. C. S. Wilkinson; and about six specimens were discovered *in situ* by us at a spot about half a mile nearer to the Brachiopod Sandstone of Mt. Lambie than the previous locality. This latter locality is distant only about one-quarter of a mile in a direct line from what appears to be the uppermost Marine Devonian Bed in that district.

This horizon would be about, perhaps, 700 or 800 feet above the top of the Marine Devonian Beds. Mr. C. S. Wilkinson has stated elsewhere that he considered that the *Lepidodendron* horizon approached within about 1000 feet of the top of the Marine Devonian Rocks.

So far, all the specimens found by us were large varieties four or five to six inches in diameter, and probably all referable to *Lepidodendron australe.*

On the fourth day of examination we found an obscure cast of *Lepidodendron* associated with Marine Devonian fossils in such a position as to leave no doubt that the loose angular block in which it was imbedded had rolled down from a horizon many hundred feet below the level of the uppermost of the *Spirifera disjuncta* beds. The cast being an obscure one, it would probably be impossible to determine the exact species of *Lepidodendron* to which it belongs, though it certainly appears to be closely allied to *Lepidodendron australe*, if not identical with it.

On the day before that on which we found the above specimen near Mt. Lambie, Mr. Clunies Ross discovered a specimen of "*Lepidodendron australe*" in a large block of Marine Devonian Sandstone at the locality previously examined by him 16 miles from Bathurst. The two discoveries were therefore made almost simultaneously, and the results confirm one another, so that it may be concluded that a *Lepidodendron*, probably *L. australe*, extends downwards into the true Devonian rocks of Australia.

The fact may be mentioned here that a species of plant apparently allied to *Lepidodendron*, though its very imperfect state of preservation renders its identity uncertain, was found by the authors *in situ* in a bed of quartzite which must be at least a thousand feet below the horizon of the uppermost *Spirifera* *disjuncta* bed. This imperfectly preserved and undescribed fossil plant is among the specimens exhibited to-night.

These discoveries do not disprove, therefore, any conclusions previously arrived at as to the age of *Lepidodendron* in Australia, but should help to carry the inquiry a stage further back into the past history of the world's plants. The obvious inference is either that some variety of *Lepidodendron* in Australia descends into the Upper Devonian, or that *Spirifera disjuncta* ascends into the Lower Carboniferous.

The fact might be mentioned here that Mr. William Anderson, Government Geological Surveyor, and Mr. P. T. Hammond, Geological Field Assistant, have lately discovered *Lepidodendron australe* at a new locality at Back Creek, near Major's Creek, in New South Wales, associated with a marine fauna of Upper Devonian or Lower Carboniferous affinities. The results of their explorations in this district, when elaborated, should therefore form an important contribution to our knowledge of the geological range of *Lepidodendron australe* in New South Wales.

NOTES AND EXHIBITS.

Professor David pointed out in reference to his Note on the discovery of the mineral sphene *in situ* in granite at the Bathurst water-works read at the Society's last meeting, that he regretted to find that, quite inadvertently, he had overlooked the fact that the Rev. J. M. Curran, F.G.S., in his paper "On the Geology and Petrography of Bathurst," in Vol. vi. (2nd Ser.) of the Society's Proceedings (p. 26), had already recorded the occurrence of the mineral sphene in Bathurst granite. He was glad of the opportunity, therefore, of rectifying the omission, and of disclaiming any intention of detracting from the credit due to a fellow-worker.

Professor David exhibited diagrams and specimens in illustration of the paper by Mr. Pittman and himself, together with a specimen of *Lepidodendron* from Back Creek, a new locality for the occurrence of this fossil lately discovered by Mr. William Anderson and Mr. P. T. Hammond of the Geological Survey of the Department of Mines, N. S. Wales.

Mr. Froggatt exhibited specimens of a crane-fly (Family *Tipulidæ*) and of a bug (Family *Reduviidæ*), showing the mimetic markings of the latter, which no doubt enable it to catch the former.

Mr. Maiden exhibited for Dr. T. L. Bancroft specimens of the tuberculous roots referred to in his paper belonging to the Leguminous genera *Desmodium, Sesbania, Medicago, Crotalaria, Mimosa,* together with photographs of the same.

Mr. Trebeck exhibited an orthopterous insect *(Phibalosoma)* from Fiji; and a scorpion from Queensland.

Mr. Fletcher exhibited for Mr. J. H. Rose, of Warialda, two interesting frogs (*Limnodynastes ornatus*, Gray, and *Heleioporus pictus*, Ptrs.), and made some remarks on their distribution. He also showed a living cystignathoid frog of large size but retiring habits, at present undescribed, from the neighbourhood of Sydney, with which he proposed to deal on a future occasion.

Mr. John Mitchell contributed a "Note on the discovery of a bone-deposit and on some of the fossils found therein":—

In December last Mr. G. K. Horan brought under my notice the discovery of a bone-deposit on the Terrible Vale Run, the property of F. G. Taylor, Esq., in the parish and county of Sandon, about two miles from the Kentucky Railway Station. Both Mr. Taylor and Mr. Horan have taken great interest in the discovery, and have devoted some considerable time and labour to its exploration. Mr. Horan has sent me several parcels of the teeth found in the deposit, with samples of the drift in which they are enclosed. The bulk of these teeth prove to have belonged to members of the *Macropodidæ* and probably to existing types. Some of the molars are large, yet not larger than those possessed by the largest living specimens of the genus *Macropus*. One large upper incisor, for the determination of which I am indebted to the assistance of Mr. Etheridge, palæontologist, and Mr. Barnes, articulator, to the Australian Museum, indicates by its massive proportions a species larger than existing forms. By the courtesy of the gentlemen just mentioned I was enabled to compare this incisor with the large incisors of others of the *Macropodidæ* from Wellington Caves, and I found it agreed with them fully, though not so large as the largest incisors from that locality.

Perhaps the most interesting are two which appear to be very small carnassial teeth of *Thylacoleo*, the presence of which would indicate a geological age corresponding with that of the older bone-deposits of Wellington and Goodradigbee Caves, and probably the Myall Creek bone-beds (Records Geological Survey of N.S.W. Vol. i. part 2).

From information and specimens supplied by Mr. Horan, I am able to give the following particulars concerning the occurrence of the deposit and of the geological features of the neighbourhood. The bones are exposed in a newly-formed water-course, and are covered by ten feet of alluvium chiefly formed of granite detritus. The bones are very tender; their interiors have decomposed and become replaced with sediment, and consequently break very easily; even the teeth in many cases have lost all their original substance except the enamel. No large bones have yet been obtained, and those observed in the deposit are fragmentary and seem to have suffered transportation. The country rock is granite, and the locality and neighbourhood for a considerable distance are very level.

Taking into consideration the physical conformation of the locality, the absence of any considerable stream, and that the covering of the bone-deposit largely consists of material derived from the erosion of granite, it may be safe to conclude that this deposit belongs to the earliest post-tertiary period. Its further exploration, therefore, might yield valuable scientific results.

Mr. Taylor has expressed an intention of making further explorations in the deposit as convenience permits, when more important discoveries may be made.

WEDNESDAY, MAY 31st, 1893.

The President, Professor David, B.A., F.G.S., in the Chair.

Mr. J. Macpherson, B.A., Sydney University, was introduced as a visitor.

Mr. A. H. S. Lucas, M.A., B.Sc., Newington College, Sydney, and Dr. Finselbach, Tweed River, N.S.W. were elected Members of the Society.

DONATIONS.

"Hooker's Icones Plantarum." Fourth Series, Vol. ii. Part 2 (March, 1893). *From the Director, Royal Gardens, Kew.*

"Geological Survey of India—Records." Vol. xxvi. Part 1 (1893). *From the Director.*

"Perak Government Gazette." Vol. vi. Nos. 8-10 (March and April, 1893). *From the Government Secretary.*

"Société Belge de Microscopie—Bulletin." Tome xix. Nos. 4-5 (1892-93). *From the Society.*

"Société d'Horticulture du Doubs, Besançon — Bulletin." Nouvelle Série, No. 27 (March, 1893). *From the Society.*

"Zoologischer Anzeiger." xvi. Jahrgang, Nos. 415-416 (March and April, 1893). *From the Editor.*

"Sydney Free Public Library—Report for 1892." *From the Trustees.*

"University of Melbourne—Examination Papers" (February, 1893). *From the University.*

"Pharmaceutical Journal of Australasia." Vol. vi. (1893), Nos. 4-5. *From the Editor.*

"Archiv for Mathematik og Naturvidenskab (Kristiania)." i.-xiv. Bd. (1876-90). *From the Royal Norwegian University, Christiania.*

"Naturwissenschaftlicher Verein in Hamburg—Abhandlungen." xii. Bd. 1 Heft (in two Parts) [1893]. *From the Society.*

"Department of Mines, Victoria—Special Reports: Report on the Bendigo Gold-Field." By E. J. Dunn, F.G.S. (1893). *From the Hon. the Minister for Mines.*

"Comité Géologique, St. Pétersbourg—Bulletins." T. x. Nos. 6-9 (1891); T. xi. Nos. 1-8 (1892); Supplément au T. xi (1892): "Mémoires." Vol. xii. No. 2 (1892); Vol. xiii. No. 1 (1892). *From the Committee.*

"Zoological Society of London—Abstract" (March 14th and 28th, 1893). *From the Society.*

"Victorian Naturalist." Vol. x. No. 1 (May, 1893). *From the Field Naturalists' Club of Victoria.*

"Department of Agriculture, Brisbane—Bulletin." No. 22 (March, 1893). *From the Under Secretary for Agriculture.*

"Geological Survey of Queensland—Report on the Russell River Gold-Field." By R. L. Jack, Government Geologist. *From the Author.*

"Entomological Society of London—Transactions," 1892, Part 3; 1893, Part 1. *From the Society.*

"Zoological and Acclimatisation Society of Victoria—Twenty-ninth Annual Report" (1892). *From the Society.*

"Naturhistorischer Verein der Preussischen Rheinlande, Westfalens und des Reg.-Bez. Osnabrück—Verhandlungen." Fünfte Folge, ix. Jahrg., Zweite Hälfte (1892). *From the Society.*

"Naturwissenschaftlicher Verein zu Osnabrück — Neunter Jahresbericht" (1891-92). *From the Society.*

"Gesellschaft für Erdkunde zu Berlin—Zeitschrift." Bd. xxvii. (1892), No. 6; "Verhandlungen." Bd. xx. (1893), No. 2 u. 3. *From the Society.*

"Société des Sciences de Finlande—Acta." T. xviii. (1891): "Oëfversigt." T. xxxiii. (1890-91). *From the Society.*

"K. K. Zoologisch-botanische Gesellschaft in Wien—Verhandlungen." xlii. Bd. 1 u. 2 Quartal (1892). *From the Society.*

"Naturforschende Gesellschaft in Bern — Mittheilungen." Jahrgang 1891. *From the Society.*

"Société Helvétique des Sciences Naturelles réunie à Fribourg —Actes." 74me Session (1891); "Compte Rendu." 74me Session (1891). *From the Society.*

"Naturwissenschaftlicher Verein für Schleswig-Holstein — Schriften." Band ix. Zweites Heft (1892). *From the Society.*

"Académie Impériale des Sciences de St. Pétersbourg — Mémoires." T. xxxviii. (viie Série), Nos. 11-13 (1892). *From the Academy.*

"Academy of Natural Sciences, Philadelphia—Proceedings for 1892." Part ii. *From the Academy.*

"National Academy of Sciences, Washington—Fourth Memoir." Vol. v. *From the Smithsonian Institution, Washington.*

"United States Geological Survey—Mineral Resources of the United States, 1889-90." *From the Director.*

"Royal Society of Victoria—Proceedings." New Series. Vol. v. (1892). *From the Society.*

"American Naturalist." Vol. xxvii. No. 316 (April, 1893). *From the Editors.*

"Johns Hopkins University Circulars." Vol. xii. Nos. 101 and 104 (November, 1892, and March, 1893). *From the University.*

"United States Department of Agriculture—Division of Entomology. Bulletin No. 28." *From the Secretary of Agriculture.*

"Australasian Journal of Pharmacy." Vol. viii. No. 89 (May, 1893). *From the Editor.*

"Agricultural Gazette of New South Wales." Vol. iv. No. 4 (April, 1893). *From the Department of Agriculture.*

"Société Royale Linnéenne de Bruxelles—Bulletin." xviii. Année, Nos. 5-6 (February and March, 1893). *From the Society.*

"Sociedade Carlos Ribeiro, Porto—Revista. Vol. ii. No. 8 (1893). *From the Society.*

"Zoologische Station zu Neapel—Mittheilungen." x. Band, 4 Heft (1893). *From the Director.*

"Société Impériale des Naturalistes de Moscou—Bulletin." Année 1892, No. 4. *From the Society.*

"Société des Naturalistes de Kiew—Mémoires." Tome xii. Livs. 1-2 (1892). *From the Society.*

"K. K. Naturhistorisches Hofmuseum, Wien — Annalen." Band vii. Nr. 3-4 (1892). *From the Director.*

"Société des Naturalistes de la Nouvelle-Russie—Mémoires." T. xvii. P. 2-3 (1892-3). *From the Society.*

"Russisch-Kaiserliche Mineralogische Gesellschaft zu St. Petersburg — Verhandlungen." Zweite Serie. xxix. Band (1892): "Materialen zur Geologie Russlands." Band xvi. (1893). *From the Society.*

"Société Zoologique de France—Bulletin." T. xvii. No. 5 (1892). *From the Society.*

"Journal of Conchology." Vol. vii. No. 6 (April, 1893). *From the Conchological Society of Great Britain and Ireland.*

Pamphlet entitled—"The Specific Rank of *Limax cinereoniger*." By W. D. Roebuck, F.L.S. (1893). *From the Author.*

PAPERS READ.

DESCRIPTIONS OF NEW AUSTRALIAN LEPIDOPTERA, WITH ADDITIONAL LOCALITIES FOR KNOWN SPECIES.

By Thomas P. Lucas, M.R.C.S., Eng., L.S.A., Lond., L.R.C.P. & M., Ed.

I have to thank Mr. Meyrick for his continued kindness and assistance in determining the genus in many instances, and for comparing specimens in the British Museum, &c. I have also to thank Mr. Illidge, Dr. Turner, and Messrs. Meek, jun., and Barnard for their great assistance and loan of specimens.

It is most interesting to note the large number of species found at Geraldton, N. Queensland, common to Ceylon; the species generally are of Indian and Malayan types.

Group SPHINGIDÆ, Family SESIADÆ.

Sesia igniflua, sp.nov.

♂♀. 14-15 mm. Head, palpi, and antennæ black, frontal rim golden tinted with blue. Thorax fire-coloured, bordered laterally and posteriorly with black. Abdomen black, with base of segments yellowish-white, those of centre segments most conspicuous. Forewings very narrow, somewhat club-shaped, costa straight, apical half rounded, apex and hindmargin rounded, fire-coloured sparingly tinted with blue, a spot at base black, submedian and transverse veins black, and at $\frac{1}{2}$ costa a black streak begins in scattered dots, but broadens at $\frac{2}{3}$ to form a marginal band and to enclose a fire-coloured subapical spot, in some specimens the black more distributed over the fire ground colour as minute specks: cilia ochreous and greyish-black. Hindwings colourless, transparent, veins black, hindmargin bordered with fire-colour clouded with black, narrowing to a line on inner border; cilia black.

Brisbane; in scrub.

Some three years ago I found empty pupa cases projecting from the bark of the Quondong tree (*Elæocarpus grandis*), but failed to obtain the perfect insect. Dr. Turner succeeded in capturing seven specimens this year and has courteously given me a pair.

Group BOMBYCINA, Family ARCTIADÆ.

NUDARIA.

A. Head white.
    Forewings with fuscous-ochreous lines..... 1. *albida.*
B. Head irrorated, or tinted, with darker.
    a. Forewings with entire costal line fuscous-black .... 2. *obducta.*
    b. Forewings without entire costal line black.
        1. Forewings without continuous transverse veins.
            i. ♂ with subcostal dark fold.......... 3. *Barnardi.*
            ii. With scattered irregular dots...... 5. *macilenta*
        2. Forewings with transverse fascia and lines............................... 4. *mollis.*

1. NUDARIA ALBIDA, Walk.

♂♀. 15-18 mm. Head white. Palpi ochreous. Antennæ fuscous-grey. Forewings with costa rounded, hindmargin rounded, creamy-white, with light ochreous-fuscous and grey markings; four pale ochreous-fuscous transverse lines undulate and denticulate; the first from $\frac{1}{5}$ costa to $\frac{1}{5}$ inner margin, is sharply angled and interrupted before middle; the second from before $\frac{1}{2}$ costa to $\frac{1}{2}$ inner margin; the third from $\frac{3}{4}$ costa to $\frac{4}{5}$ inner margin; the fourth extending from $\frac{3}{4}$ costa to $\frac{3}{4}$ hindmargin, but interrupted in the middle of the wing; a hindmarginal row of ochreous-fuscous dots; a dark suffused streak uniting first and second lines along inner margin, two minute but conspicuous black dots in disc, one each immediately before 1st and 2nd lines: cilia creamy-white. Hindwings and cilia creamy-white.

Queensland; in scrubs and at light.

Meyrick in his monograph refers to this as a species unknown to him. He was afterwards able to identify it from specimens I sent. Walker's description is incomplete and not absolutely correct. I therefore redescribe it.

2. Nudaria obducta, sp.nov.

♂♀. 12-16 mm. Head, palpi, and antennæ light grey. Thorax grey, abdomen whitish-grey, darker grey at base of segments. Forewings with costa rounded, hindmargin rounded, light grey, with spots and blotches of darker grey; a streak of black-grey along centre of wing at base; costal line dark fuscous-grey, interruptedly thickened with darker spots; veins grey, with a conspicuous row of hindmarginal black-grey dots; a diffused grey fascia from $\frac{1}{8}$ costa to $\frac{1}{2}$ inner margin, where it forms a conspicuous black-grey blotch, thence suffused along inner margin, becoming obsolete toward anal angle; an oblong patch of black-grey from $\frac{2}{5}$ to $\frac{3}{5}$ costa for one-fourth the breadth of wing; an angled black-grey blotch at $\frac{4}{5}$ costa: cilia white-grey. Hindwings white lightly tinted with grey; hindmarginal line darker grey; cilia as forewings.

Brisbane to Mackay; in scrub, rare.

3. Nudaria Barnardi, sp.nov.

♂♀. 12-14 mm. Head whitish-grey. Antennæ ochreous. Thorax and abdomen ochreous-white. Forewings with costa gently rounded, hindmargin rounded, white, semi-hyaline, thinly scaled; veins indistinctly ochreous, darker on hindmargin, in ♂ a dark fuscous-grey fold of wing from opposite middle of base to costa at $\frac{3}{5}$; three or four light ochreous indistinct spots along costa, more marked in ♀; a row of hindmarginal dots of same colour: in the female in addition a stained spot showing from undersurface below median at $\frac{2}{5}$, two small dots between this and costa at $\frac{1}{6}$, dots near base and at $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ of inner margin, and an irregular row of submarginal dots larger than the hindmarginal dots; a small discal and discoidal spot at $\frac{1}{3}$ and $\frac{2}{3}$ dark black: cilia white. Hindwings as forewings, without markings except that veins are shaded toward hindmargin; cilia white.

Geraldton, Johnson River, Queensland (Messrs. Meek and Barnard).

4. NUDARIA MOLLIS, sp.nov.

♂♀. 13-15 mm. Head, antennæ, thorax and abdomen light ochreous. Forewings with costa rounded, hindmargin rounded, white, freely diffused and marked with light ochreous-fuscous; a small black dot on costa near base, subtending a second before middle of wing, and a third near inner margin at $\frac{1}{8}$; second dark fuscous dot on costa at $\frac{1}{8}$; and a third at $\frac{2}{3}$ costa, which subtends a light ochreous fascia, extending parallel to hindmargin, to a dark ochreous dot on $\frac{1}{3}$ inner margin; this is broad on costa, becoming a line before middle, and is dentate $\frac{1}{3}$ from inner margin; a conspicuous fuscous-black discal spot at $\frac{1}{2}$; interrupted short lines and dots of fuscous-ochreous along costa; an ochreous fascia from a dark spot $\frac{2}{3}$ costa to $\frac{4}{5}$ inner margin, thrice sharply angled in costal half, thence curved inward and then outward on inner half; a minute discoidal spot at $\frac{3}{4}$ in a line with discal spot; beyond this a broad fuscous-ochreous fascia, rounded on anterior border to $\frac{3}{4}$ hindmargin and denticulate twice or thrice on posterior border (and not touching hindmargin) to opposite $\frac{2}{3}$ hindmargin; a dark lunular mark obliquely from inner margin of anal angle is faintly connected with this outer fascia; a row of dark fuscous or black dots on hindmargin: cilia ochreous. Hindwings white; cilia white.

Near Brisbane; in scrub.

Dr. Turner took a specimen in excellent order. I had previously taken two or three rubbed specimens. Much more richly marked than the other species.

5. NUDARIA MACILENTA, sp.nov.

♂. 14 mm. Head white, face black, orbital rims white. Palpi black. Antennæ fuscous. Thorax white, posteriorly a dorsal spot black. Abdomen ochreous-grey. Forewings with costa gently rounded, hindmargin obliquely rounded, white with scattered grey scales and fuscous markings and veins grey; a fuscous line of dots at $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{4}$ and $\frac{4}{5}$ costa, a light inconspicuous grey fascia from 1st dot to submedian vein near base; three light grey linear dots subtending veins in a line from 3rd costal dot to $\frac{1}{4}$ inner margin; a fuscous outline mark resembling an erect skeleton of a bird from below median to before $\frac{3}{4}$ inner margin; a dentate mark below median at $\frac{5}{6}$; a row of faint hindmarginal fuscous dots: cilia white. Hindwings white; cilia as forewings.

Brisbane; one specimen.

Family PSYCHIDÆ.

OECETICUS BICOLOR, sp.nov.

♂. 26 mm. Head, thorax and abdomen ferruginous-ochreous. Antennæ black, midrib white, pectinations narrowing at base and apex. Forewings with costa gently rounded, hindmargin rounded, light ochreous-drab or mouse-colour, thinly scaled, veins darker: cilia darker or more a fuscous-drab. Hindwings as forewings.

Victoria.

An unpretentious-looking insect, the centre ferruginous-ochreous being the more conspicuous because of the sombre-looking wings.

Family BOMBYCIDÆ.

BOMBYX CRENULATA, sp.nov.

♂. 34-38, ♀. 60 mm. Head, thorax and abdomen dark chocolate, in ♀ the thorax lighter, chocolate-fuscous. Palpi dark chocolate, tipped with ferrous-fuscous, in ♀ light chocolate-fuscous. Antennæ reddish-ochreous, midrib fuscous-red, in ♀ pectinations very short, serrate-like. Forewings with costa nearly straight, rounded at apex, hindmargin nearly straight, finely crenulate, dark chocolate with darker-coloured veins; a small black discal spot at $\frac{2}{5}$ near median, scarcely traceable or absent in ♀, a darker fine hindmarginal line in ♂, ochreous between crenulations in ♀: cilia alternately chocolate and ochreous. Hindwings dark chocolate, very hairy over inner margin; cilia chocolate.

The ♀ in general appearance is a lighter chocolate or more a chocolate-fuscous. The moth especially reminds one of the small Lappet moth of England.

Eltham, Melbourne; one specimen without the black discal spot, taken by the late Mr. David Kershaw: Brisbane; three specimens at light.

Family LIPARIDÆ.

DARALA SERRANOTATA, sp.nov.

♀. 63-67 mm. Head, thorax and abdomen light ferrous-ochreous. Antennæ smoky-black, ferrous-ochreous at base. Legs black, densely padded with chocolate-ochreous hairs. Forewings triangular, widely dilate, costa nearly straight, apical third rounded, hindmargin gently rounded, light chocolate-ochreous, semi-hyaline, veins darker chocolate, costal band and base of wings ferrous-ochreous; an ochreous-white discal spot beneath costal band at $\frac{2}{5}$, an ochreous-white serrate fascia at $\frac{7}{8}$ parallel with hindmargin; hindmargin beyond this covered with darker chocolate scales, not hyaline: cilia ochreous-white. Hindwings as forewings with serrate fascia continuous with that of forewings; cilia as forewings.

Barnard Island; one specimen reared by Mr. Barnard: near Cairns; one specimen in Brisbane Museum.

Group GEOMETRINÆ, Family GEOMETRIDÆ.

IODIS FASCINANS, sp.nov.

♂. 35 mm. Head glaucous-green, face bordered with white. Palpi fuscous spotted and tipped with white. Antennæ fuscous. Thorax glaucous-green, irrorated with white hairs, and with a dorsal diamond-shaped white patch posteriorly, containing four green dots; undersurface white, with a fringe of long white hairs. Abdomen white, irrorated with green, each segment bordered with green lines posteriorly and laterally, and with two green lines dorsally diverging posteriorly in each segment, apical segment green with a fine central line of white and bordered with white; undersurface white. Legs white, anterior tibiæ green, sparingly barred with white. Forewings rather broadly dilate, costa rounded, hindmargin waved, gently rounded, glaucous-green, thinly scaled, with darker green veins and white dots on the veins; costal band dark green, sparingly dotted with white in apical half, basal third of wings whitened by numerous irregular broken white lines, dots and patches, a white wavy line, thrice broadly dentate from $\frac{2}{5}$ costa to $\frac{1}{2}$ inner margin, a white patch in costal third immediately beyond, an interrupted white fascia, formed of three broad wavy dentate lines or bars partially interrupted immediately below apex, and thinned out to lines and dots on anal third, a hindmarginal interrupted black dentate line, with dots on inner and outer angles: cilia glaucous-green, tinted with darker green and sparingly with white. Hindwings as forewings, with basal white predominating as far as $\frac{2}{5}$ costa to $\frac{3}{5}$ inner margin, inner margin strongly irrorated with green, at apical angle a blotch of rose colour with a white spot bordered with black on inner border of costa, the black extending as a line along hindmargin and thence suffused, the blotch bordered by white; beyond this rose-coloured patch on hindmargin an equal-sized band of ground colour, then a conspicuous patch of white, formed of three wavy white bands, and again a patch of ground colour at anal angle; hindmarginal line and cilia as forewings.

Brisbane; one specimen (Mr. Illidge), October, 1892.

Iodis eucalypti, Luc. Mr. Meyrick has kindly compared with *I. metaspila*, Walk., in British Museum, and he pronounces them the same, consequently the former name must lapse.

Family MONOCTENIADÆ.

ARRHODIA (?) ILLIDGEI, sp.nov.

♂. 37 mm. Head light creamy-fuscous, suffused with rose, forehead yellow, face light ochreous-fuscous with black scales.

Palpi fuscous. Antennæ yellow, pectinations fuscous. Thorax light creamy-fuscous, tinted with rose colour anteriorly, with a dense development of grey-white hairs beneath. Abdomen creamy-fuscous. Legs fuscous, femora and tibiæ crimson-red, striped and annulated with ochreous-yellow. Forewings triangular, costa sparingly sinuous, apex produced, rounded; hindmargin obliquely rounded, light creamy or ochreous-fuscous with a scarcely perceptible rosy tint, and sparsely lightly and thinly pencilled with black, darker and more conspicuous at apical and anal angles; costal margin reddish-yellow, a row of three smoke-coloured dots, first at ½ costa, this slightly diffused, second on median at ⅓, and third opposite ⅓ of inner margin; a semilunar black spot on costa at ⅔; a row of small black dots on veins from opposite ⅔ inner margin to near the apex of a fuscous fascia formed of interrupted dots or blotches from opposite inner margin at ¾ to costa just before apex, the blotch near inner margin large, diffused and bordered with fuscous or reddish-black and suffused with rose colour, the next spot smaller, the centre ones smallest, but the spots again become larger toward costa, where there is a rosy suffusion filling the apical angle, and with a dark spot on hindmargin near apex: cilia dark ochreous-fuscous. Undersurface of forewings greenish-ochreous-fuscous finely pencilled with black, apex rosy dotted with white, inner margin rose-tinted. Hindwings light ochreous-fuscous sparsely pencilled with fine black congregated chiefly throughout middle third of wing; costa rosy; cilia as forewings.

Brisbane (Mr. Illidge), October, 1892.

This also comes near to *Gastrophora*, and will, I think, have to be formed into a new genus.

Group NOCTUINA, Family AGARISTIDÆ.

AGARISTA FLUITANS, sp.nov.

♀. 35 mm. Head grey, face ashy-grey, with a triangular patch on crown and a spot adjacent to orbit on either side rich velvety black. Palpi black, ashy-grey at base. Antennæ black. Thorax fuscous-black, with an inconspicuous linear ochreous fringe behind collar. Abdomen black, segments bordered with golden-yellow, caudal segment tipped with black. Legs black-grey, banded with white. Forewings triangular, moderately dilate, costa nearly straight, hindmargin rounded, rich fuscous-black, with a few scattered inconspicuous grey scales and a conspicuous curving undulating white fascia from $\frac{3}{5}$ costa to anal angle, resembling a rivulet with an arm or slight angular projection on anterior border at $\frac{1}{2}$, and one on posterior border at $\frac{4}{5}$: cilia fuscous-black. Hindwings dark black; cilia black shaded with grey.

Brisbane; one specimen at light, November, 1892.

Family LEUCANIDÆ.

LEUCANIA EXARANS, sp.nov.

♂♀. 27-30 mm. Head, palpi, antennæ, thorax and abdomen light wainscoat or light ochreous-fuscous. Forewings elongate, narrowly dilate, costa gently rounded, hindmargin rounded; light ochreous-fuscous, veins lighter ochreous, a deep black line from base below submedian to nearly $\frac{1}{2}$ length of wing, where it breaks up into a few inconspicuous scattered black specks; a 2nd and narrower black line commencing at $\frac{1}{3}$ of wing running parallel to median, then dividing into smoky shaded lines between veins; a hindmarginal row of black dots and a narrow hindmarginal light ochreous line: cilia ochreous-fuscous shaded or banded with smoky-grey. Hindwings ochreous-fuscous shaded with diffused smoky-black, darker toward hind border; veins smoky-fuscous; cilia ochreous banded and edged with grey.

Williamstown, Melbourne; three specimens.

LEUCANIA OBUMBRATA, sp.nov.

♀. 32 mm. Head, palpi, thorax and abdomen dusky ochreous very finely speckled with smoky-fuscous; undersurface of thorax with a woolly cushion of long hairs. Antennæ dusky ochreous. Legs dusky ochreous, anterior and middle tibiæ banded with ferrous-fuscous. Forewings with costa gently rounded, hindmargin rounded, dusky ochreous very finely dusted with smoky-grey and a number of smoke-coloured dots; a row of three smoke-coloured dots, one on costa at $\frac{1}{4}$, the other two at equal distances between this and inner margin at $\frac{1}{4}$, a dot on costa at $\frac{3}{5}$, a row of eight dots from near costa at $\frac{3}{4}$ to $\frac{3}{4}$ of inner margin; a hindmarginal lighter groundcolour line bounded anteriorly by a row of minute dots and posteriorly by a band finely barred with short smoky-fuscous lines: cilia ochreous. Hindwings dusky ochreous; cilia light ochreous with a smoky-fuscous band. On the undersurface the forewings are ochreous, finely dusted with smoky-fuscous, with a smoky-fuscous suffused median line terminated by a broad smoky-fuscous band at $\frac{2}{3}$. The undersurface of the hindwings is as in forewings, the broad band being continuous with that of forewings; there is also a very conspicuous smoky-fuscous discal spot.

Melbourne; one specimen.

CALAMIA SUFFUSA, sp.nov.

♂. 38 mm. Head ochreous-fuscous, eyes chocolate colour. Palpi darker fuscous at base and tips, shaded to ochreous in centre. Antennæ ochreous-fuscous. Legs darker fuscous, ochreous on undersurface. Thorax ochreous-fuscous, becoming darker posteriorly. Abdomen ochreous-fuscous, with a darker fuscous blotch anteriorly on dorsum of 1st segment, and narrow blotches laterally on hind segments. Forewings with costa gently rounded, hind-margin rounded, ochreous-fuscous; veins prominent, finely lined with light ochreous, sharply bordered with red-ochreous, which is suffused to borders of interspaces; costa finely lined with ochreous: cilia fuscous, margined with ochreous. Hindwings ochreous-fuscous, lighter toward inner margin, veins finely lined with light ochreous, bordered and suffused over interspaces with smoky-fuscous; cilia light ochreous, suffused toward apex with darker fuscous. The undersurface of the forewings is dark smoky-fuscous, excepting a narrow median band and a narrow bordering which are ochreous; cilial band smoky-fuscous. The undersurface of the hindwings is very light ochreous, and is dusted with fuscous over outer $\frac{2}{3}$ of wing, with a streak of fuscous along inner marginal fold.

Frankston, near Melbourne; one specimen at dusk on *Casuarina* flowers, in April.

Family ORTHOSIDÆ.

ORTHOSIA COLUMBARIS, sp.nov.

♂♀. 33-38 mm. Head, palpi, antennæ, thorax and abdomen creamy-grey. Forewings with costa rounded at base, thence straight, hindmargin rounded, creamy-grey, costal fourth lighter grey, space between this and hindmargin diffused with orange-red, a triangle of three black dots on costa near base and at equal distances on costal side of median vein; a circular line of four black dots on costa at $\frac{1}{3}$, before median, and on median and submedian veins, an oblique line of four black dots from $\frac{2}{3}$ costa to submedian vein, a prominent rhomboidal discal spot between the 2nd and 3rd, a circular line of six or seven black dots on veins from opposite costa at $\frac{3}{4}$ to near hindmargin at $\frac{3}{4}$; the orange-red suffusion forming an irregular boundary line across the wing at $\frac{5}{6}$ and there becoming darker red interspersed with black, beyond it a very light cream-coloured band with terminal line of black dots, and contrasting in colour with the cilia, which are dark red, shading on either border to ochreous-red. Hindwings creamy-white, shaded with smoky-grey towards hindmargin; cilia white.

Frankston, near Melbourne; on *Casuarina* flowers at dusk, March and April, 1886.

Family POLYDESMIDÆ.

PANTYDIA CAPISTRATA, sp.nov.

♂♀. 43-48 mm. Head drab-grey. Palpi dark grey. Antennæ drab-grey. Thorax blue or iron-grey, sparingly dusted with black, and *with a rich black velvety collar*. Abdomen blue or iron-grey, freely covered anteriorly with fringing drab-grey hairs. Forewings with costa gently rounded, hindmargin rounded narrowly scalloped, blue or iron-grey freely dusted with black; a lighter discal shade at ½ approaching costa, more or less conspicuous; in some specimens a small velvety black dot at ⅓ near inner margin; a fine ochreous line ⅘ costa to ⅚ inner margin, bordered anteriorly by a smoke-coloured band shading into groundcolour, and bounded posteriorly by a reddish band, in a few specimens conspicuously spotted with black; a narrowly scalloped ochreous terminal line bordered with black and smoky-grey: cilia drab-grey, bordered with smoky-grey. Hindwings reddish-fuscous, with a lighter diffused band at ⅔ dividing off a smoky-black hind border; cilia reddish-fuscous, faintly lined with grey.

Brisbane.

Allied to *P. Diemeni*, Gn., but larger, less variable, with fewer markings, and easily known by the rich black collar.

Family PALINDIIDÆ.

HOMODES VIOLACEA, sp.nov.

♀. 14 mm. Head and thorax creamy-grey tinted with a violet hue. Palpi fuscous. Antennæ ochreous-grey. Abdomen creamy-grey anteriorly tinted with violet, posterior segments broadly based with fuscous-grey. Forewings triangular, broadly dilate, costa nearly straight, hindmargin slightly scalloped before middle, prominently rounded beyond middle and thence obliquely straight to anal angle; creamy-grey with darker shades and markings of grey, and tinted with a violet hue; costal and hindmarginal line continuous, deep fuscous-red; a dot at ¼ costa, and another immediately beyond darker grey; a median diffused grey fascia with its anterior border darker fuscous-grey, with a black discal spot, and with its posterior border edged by a sinuous denticulate fuscous-grey line suffusing into a creamy-violet hue; a suffused blotch of grey at ⅓ and a second larger suffused blotch at anal angle of hindmargin: cilia fuscous-red. Hindwings as forewings, with a fuscous-grey fascia from before ½ costa to ⅓ inner margin, divided into two lines in costal half by patch of groundcolour; a second linear denticulate fascia from ¾ costa to ⅔ inner margin; a faint line immediately beyond, and a diffused hindmarginal fascia of same colour; hindmarginal line and cilia as forewings.

Brisbane; one specimen at light.

This is allied to *H. oblatoria*, Walk.

HOMODES OBLATORIA, Walk.

The larva of this offers a curious example of mimicry. Seen on the fence feeding, it appears like that of *Iodis insperata*, Walk., or *I. pieroides*, Walk. It has a number of flattened out projections spreading out from each side of the back, of various shades of green and grey. On touching the larva these collapse, being only appendages of lichen and spores glued on to the creature's skin in a tower-built fashion. The larva is yellowish-green and simulates a *Pyrale* larva in appearance. The lichen cannot be detached at the skin. The chrysalis is spun in an eggcup-shaped cocoon of lichen. Feeds on lichen.

Brisbane.

Family HEMICERIDÆ.

WESTERMANNIA OCELLATA, sp.nov.

♂♀. 22-26 mm. Head ashy-grey, sprinkled with dark fuscous, face fuscous. Palpi fuscous. Antennæ fuscous, becoming white at the base. Thorax ashy-grey, sprinkled freely with fuscous. Abdomen light fuscous-ochreous. Forewings with costa nearly straight, hindmargin gently rounded, ashy-grey irrorated with various shades of grey, fuscous and ferrous scales; three fuscous black stripes on costa, at $\frac{2}{5}$, $\frac{2}{3}$ and $\frac{4}{5}$, the latter diffused; an indistinct wavy line from first costal stripe passes obliquely to middle of wing at $\frac{1}{2}$ where it is recurved almost at a right angle to $\frac{1}{2}$ inner margin, a more distinct line, interruptedly black, from second costal stripe, runs obliquely half way to hindmargin, is there parallel with second fourth of hindmargin and then is sinuated along and below median fold to a point opposite first line, thence sharply to inner margin at $\frac{2}{3}$, the space enclosed by the inner half of these two lines deeply coloured with fuscous and black, forming a conspicuous blotch on hindmargin, finely outlined by black, bordered with grey-white; a grey denticulate inconspicuous fascia more or less diffused between this and the hindmargin, and an interrupted hindmarginal line of black dots: cilia fuscous, banded with darker fuscous. Hindwings light fuscous-ochreous, with a diffused dark fuscous hindmarginal border; cilia ochreous, barred with fuscous.

Brisbane; rare.

Family GONOPTERIDÆ.

ANOMIS (GONITIS) DEFINATA, sp.nov.

♂♀. 28-30 mm. Head, palpi, antennæ, thorax and abdomen ochreous-drab. Forewings with costa wavy, apex rounded, acute, hindmargin sinuous, produced to angular projection in middle, light ochreous-drab, with dark fuscous lines, and dusted with dark specks, and crossed by numerous short dark strigulæ; a short line close to base; a 2nd line from $\frac{1}{5}$ costa, obliquely to $\frac{1}{3}$ median vein, thence at an angle to $\frac{1}{3}$ inner margin; a third line from beyond $\frac{1}{2}$ costa extends to median vein; a fourth line from $\frac{3}{4}$ costa obliquely for a short distance, then bows outward rounding to median vein and thence straight to $\frac{2}{3}$ inner margin; a fifth line from $\frac{7}{8}$ costa runs parallel with hindmargin to $\frac{7}{8}$ inner margin, and is diffused anteriorly with fuscous shading into ground colour; a dark hindmarginal line: cilia ochreous, fuscous at base. Hindwings reddish-ochreous, lighter ochreous towards base, a dark hindmarginal line; cilia creamy-ochreous.

Geraldton; (Messrs. Meek and Barnard).

Allied to *A. dyima*, Meyr., but differs in colour and markings, and has 4th line bowed and straight, which in *A. dyima* is like a └┐.

Family CATEPHIIDÆ.

MELIPOTIS COLLUSTRANS, sp.nov.

♂♀. 36♂-48♀ mm. Head fuscous more or less mottled with darker fuscous and drab. Palpi with second joint squamose, fuscous barred with ochreous-grey, third joint bar-like, lighter fuscous, with two bands of fuscous-grey. Antennæ fuscous, finely annulated with fuscous-drab in ♂, scarcely perceptible in ♀. Thorax rich fuscous mottled with ochreous and fuscous-grey, darker on sides than on dorsum. Abdomen rich fuscous, basal segment covered with fringe of black, three or four segments fringed with fine whitish hairs. Legs with the femora pilose, ochreous-fuscous, the tibiæ laxly clothed, fuscous-black, the tarsi fuscous-black tipped at each joint with ochreous-fuscous. Forewings with costa nearly straight, hindmargin rounded, ochreous-fuscous mottled with shades of fuscous and black, costa irrorated more or less with ochreous lines and black, a rich black angular curved line at base half across wing, a second from $\frac{1}{4}$ costa to vein 1 opposite to $\frac{1}{3}$ inner margin, thrice dentate, space enclosed between this and basal line more or less filled with rich black, dashed with fuscous and ochreous; a third black sinuous denticulate circular line from $\frac{3}{5}$ costa running for $\frac{2}{3}$ parallel to hindmargin, curving outward toward anal angle to vein 1, and again obliquely turning to $\frac{3}{4}$ inner margin; the space between this and the 2nd line more ochreous in ♂, a black triangle in the centre across vein 2, giving off an arm on either side quickly becoming inconspicuous, an ill-defined reniform spot on basal or anterior arm; a fourth line from apex running obliquely for $\frac{1}{10}$ of wing and then parallel to hindmargin, sharply turning to anal angle, ochreous bordered on either side with black, and in some specimens shot with blue, the space between this and the third line in some specimens mottled with black, a darker lunar patch filling the costal third, and a short black line running along the centre, a blue shading, in others a whitish shading on outer $\frac{2}{3}$ of inner margin; in the ♀ the space beyond the fourth line, the hindmarginal $\frac{1}{6}$ and inner marginal $\frac{1}{4}$ ochreous-fuscous, the remainder of the costal portion of the wing almost covered with black: cilia fuscous-black. Hindwings black, with ochreous-fuscous towards base, an oval white blotch in centre of wing, a narrow white band just before apex, and another just before anal angle of hindmargin; cilia black, white or fuscous-grey.

Geraldton (Messrs. Meek and Barnard).

Allied to *M. pannosa*, Moore.

Family OPHIDERIDÆ.

OTHREIS (OPHIDERES) IRIDESCENS, sp.nov.

♂. 65 mm. Crown of head golden-yellow, forehead purple-fuscous, face vermilion-orange. Palpi with second joint squamose, orange-yellow on inner side, purplish-fuscous on outer side, with a line of blue in centre, and narrowly bordered with fuscous-yellow at base; third joint narrowly club-shaped, fuscous, club fuscous-black tipped with yellow. Antennæ fuscous-grey. Thorax fuscous, with a yellow collar, divided into three by a vermilion band, narrowed on dorsum, posteriorly orange-yellow. Abdomen yellow, with long orange hairs, caudal segment fuscous-black, lighter at tip. Legs fuscous, anterior tibiæ with a rich yellow dot near centre, and with long fuscous and yellow hairs. Forewings triangular, costa rounded, hindmargin gently and obliquely rounded, inner margin sinuous; fuscous with lighter and darker shades and marblings, tinted with blue-grey and ochreous, and pencilled with lines of darker fuscous; a rich chocolate band from costa just beyond base to vein 1, a second like band from $\frac{1}{4}$ costa to vein 1 at $\frac{1}{6}$, bordered posteriorly by an ochreous-fuscous line, a 3rd line less conspicuous from before $\frac{1}{2}$ costa to near inner margin at $\frac{2}{5}$; a discoidal oval blotch having anterior half fuscous edged with fuscous-black, and posterior half ochreous-fuscous, suffused posteriorly into groundcolour; a light ochreous-fuscous line from $\frac{3}{4}$ costa, parallel to hindmargin for $\frac{1}{2}$ distance, where it curves inward to vein 2, and thence is bent obliquely to inner border at $\frac{1}{2}$, broadly dilate at costa and narrowing to inner margin, bordered posteriorly with a line of rich black; a broad hindmarginal band of blue-grey narrowing to anal angle, diffused with ochreous on anterior border, and subtended by a fuscous band $\frac{2}{3}$ toward hindmargin: cilia blue-grey. Hindwings orange-red, with a deep rich black border, half the depth of wing on costa and narrowing to a point on anal angle; cilia grey-black.

Geraldton (Messrs. Meek and Barnard).

RHYTIA (OPHIDERES) CREPIDOLATA, sp.nov.

♂. 60 mm. Head ochreous, forehead with slaty-grey tuft. Palpi slaty-grey, 2nd joint with greyish-ochreous lines on outer and inner sides, third joint with broad clavate tufted top tipped with black. Antennæ ochreous-fuscous. Thorax with anterior part and patagia ashy-grey, posterior portion darker grey mixed with black. Abdomen yellow or brick colour, caudal appendage black. Legs olive-fuscous, anterior tibiæ with a white dot on upper surface and a pad of hairs on undersurface, orange at root, olive-fuscous in spread out pad. Forewings with costa rounded, apex acute, hindmargin rounded, convex, inner margin rounded in a prominent projection on basal $\frac{2}{5}$; green-bronze, correlated with creamy-ochreous, and crossed by numerous sinuous dark bronzy-green lines; a dark line from $\frac{1}{4}$ costa to just before $\frac{1}{4}$ inner margin, bordered posteriorly by a creamy-ochreous line suffused in a light lunar patch; a median bronzy-green fascia suffused on anterior border into the light lunar patch, posterior border from $\frac{1}{2}$ costa obliquely to middle of wing, thence at an angle to inner margin at $\frac{1}{2}$, bordered by a suffusion of creamy-ochreous, shaded on costal portion by light bronzy-green; a diffused bronzy-green fascia with anterior border sharply defined from $\frac{3}{5}$ inner margin obliquely toward apex but rounded just before costa to $\frac{3}{4}$ costa, posterior border less sharply defined from apex, indistinctly parallel with hindborder to anal angle, more or less shaded on inner portion into ochreous or creamy-grey, a patch of bronzy-green on hindmargin, diffused into a line at $\frac{3}{5}$: cilia grey tinted with bronze. Hindwings yellow or brick colour with a deep black border, $\frac{3}{5}$ depth of costa sinuous and irregularly and slightly prolonged at points on anterior border narrowing to one-third the depth at anal angle; a white cilial row of lunular spots.

Geraldton (Messrs. Meek and Barnard).

Allied to *R. Hypermnestra*, Cramer.

Family HOMOPTERIDÆ.

GIRPA (HULODES) INANGULATA, Gn.

Queensland generally.

GIRPA (HULODES) ERIOPHORA, Gn.

Geraldton (Messrs. Meek and Barnard).

GIRPA (HULODES) PERTENDENS, Walk.

Queensland generally.

GIRPA (HULODES) FRATERNA, Moore.

Geraldton (Messrs. Meek and Barnard).

I believe the above to be varieties of one species. The whole occurring in Queensland as in India seems to confirm this opinion, while in a large number we meet with every intermediate form. If this view be correct, all the species except *G. inangulata*, Gn., must drop.

ANODAPHA BOARMOIDES, Gn.

Brisbane; also in Ceylon.

Family PHYLLODIDÆ.

AGONISTA MEEKII, sp.nov.

♂♀. 50-58 mm. Head, antennæ, palpi, thorax and abdomen ochreous-fuscous or fuscous-drab. Forewings triangular, broadly dilate, costa straight, apical third rounded, apex acute, hindmargin obliquely rounded, fuscous-drab, cinereous-drab or ochreous-fuscous, thickly dusted with black; a black fascia diffused like an ink-blot from $\frac{1}{4}$ costa to $\frac{1}{4}$ inner margin, a second immediately beyond, a third extending as a diffused smoky-fuscous band from costa at $\frac{3}{5}$ to $\frac{5}{6}$ to inner margin, from $\frac{3}{4}$ to anal angle, with three or four darker bands crossing; a fourth and dark black linear straight band from $\frac{4}{5}$ costa to just before anal angle on inner margin, bordered with ochreous on anterior border and smoky diffusion on posterior border; two ochreous dots near base and a black dot at $\frac{3}{4}$ of vein 6, a series of black dots along vein 2, in some specimens a smoky diffusion at apex, with a black patch against 4th band and diffused patches along same band near inner margin; a lighter space beyond this leaves a lunular-shaped hindmarginal dark fascia; the ♀ almost without markings except the fourth band which is more ochreous or fuscous, and the veins which are ochreous; a hindmarginal row of black dots: cilia ochreous-fuscous. Hindwings as forewings, with a black fascia at $\frac{1}{2}$, and a broad diffused smoky fascia separated by a lighter ochreous-fuscous space immediately beyond; a line of hindmarginal dots and cilia as in forewings. Markings lighter in ♀.

Geraldton (Messrs. Meek and Barnard).

Allied to *Agonista reducens*, Walker. This species is very variable, but evidently all the specimens belong to one with two or three marked variations.

Family DYSGONIIDÆ.

THYAS REGIA, sp.nov.

♂♀. 75-80 mm. Head and thorax chocolate-fuscous. Palpi stout, reddish-fuscous, third joint in ♂ thick, in ♀ long and rodlike. Antennæ light fuscous, reddish-ochreous on underside, ciliated in ♂. Abdomen orange-red, shaded with fuscous anteriorly. Forewings elongate-triangular, costa gently rounded toward apex, hindmargin waved, convex; dark fuscous with fine black, grey and blue-grey scales, the latter predominating in ♀; a sinuous blue-grey line from $\frac{1}{5}$ costa to $\frac{3}{7}$ inner margin, with a line running from it along submedian to near base, and giving a branch to costa just beyond base; this line in ♂ marked with black; a reniform spot at $\frac{1}{2}$, divided into a costal elongate spot, and a rounded inner circle, blue-grey in ♀, black in ♂; a deep black fascial line from $\frac{3}{5}$ costa to $\frac{3}{4}$ inner margin, in ♀ tinted with grey-blue on anterior border, and suffused into groundcolour posteriorly; a suffused waved sinuous linear fascia from costa just before apex, to anal angle, concave in centre: cilia black tinted with fuscous-grey. Hindwings orange-red, with a black hindmarginal border, irregular and prolonged along veins on anterior border, suffused with orange-red on posterior border, and toward $\frac{3}{4}$ of hindmargin, where the black tint is diffused along submedian vein to near base; cilia orange-red varied with black and grey.

Geraldton, Johnson River (Messrs. Meek and Barnard).

Allied to *T. coronata*, Fabr.

Family THERMESIIDÆ.

SYMPIS PARKERI, sp.nov.

♂♀. 38-42 mm. Head vermilion-fuscous, crown with a white or ochreous lunar mark; face variegated with white. Palpi fuscous, variegated with white or ochreous. Antennæ fuscous, whiter toward extremity. Thorax vermilion-fuscous. Abdomen fuscous or fuscous-grey, segments bordered with lighter grey. Forewings elongate-triangular, costa slightly waved, hindmargin nearly straight, vermilion with fuscous tint, and shaded by fuscous and lines of darker fuscous; a fuscous dot at base on median, and a faint row of dots along median, a small black discal spot at $\frac{1}{3}$, nearer costa; a wavy denticulate border at $\frac{3}{7}$ marking off the outer fuscous half of wing, crossed near its anterior border by two interrupted fine black lines, in its centre by three small vermilion dots or by four larger dots closely approximate, and by a submarginal white suffused line; hindmarginal line fuscous: cilia fuscous barred with white. Hindwings vermilion or vermilion-grey at base, and banded by fuscous, by a white or bluish-grey fascia and again by darker fuscous or blue-black from within outwards, a submarginal whitish shade in middle third and a hindmarginal dark fuscous line; cilia white on inner border, fuscous near apex, white and grey in median expanse.

Brisbane, at Glen Retreat Orangery (Mr. Parker); a second taken at a lamp.

Allied to *S. rufibasis*, Guénee, from India.

SONAGARA SCITARIA, Walk.

A variety of this, yet not sufficiently distinct to make into another species, was taken by Messrs. Meek and Barnard at Geraldton.

SENERATIA PRÆCIPUA, Walk.

Geraldton, Johnson River (Messrs. Meek and Barnard); also taken in Ceylon.

SENERATIA BARNARDI, sp.nov.

♂♀. 30-33 mm. Head fuscous. Palpi fuscous, black on upper side of 2nd segment. Antennæ fuscous-ochreous. Thorax fuscous, violet anteriorly, collar ochreous-fuscous. Abdomen fuscous, tinted with black, caudal appendage in ♂ ochreous. Legs dark fuscous, tarsi with ochreous spots. Forewings triangular, moderately dilate, costa slightly wavy, nearly straight, hindmargin obliquely rounded, ochreous-fuscous, darkened by a tint of violet and by shadings of darker fuscous and black; a crenate dark fuscous line from $\frac{1}{5}$ costa to $\frac{1}{5}$ inner margin; a median dark fuscous fascia darkened with black, anterior border straight just before $\frac{1}{2}$ costa to just before $\frac{1}{2}$ inner margin, anterior portion of fascia dark and black, posteriorly diffused to posterior border, which is a crenate circular line from $\frac{3}{5}$ costa to $\frac{4}{5}$ inner margin, a black discal spot near centre of fascia; beyond this is another similar line but less conspicuous, a hindmarginal row of black dots; in some specimens the veins are ochreous-fuscous, in others darker: cilia fuscous-grey. Hindwings with colour and markings as in forewings; 1st line obsolete, median band darker anteriorly, diffused posteriorly, 3rd line bordered by an ochreous shading, and beyond it another inconspicuous fuscous line; cilia fuscous-grey with ochreous basal line.

Geraldton, Johnson River (Messrs. Meek and Barnard).

Differs from *S. præcipua* in being only $\frac{2}{3}$ size, and in having head and palpi fuscous to black instead of chocolate-ochreous; the wings are blacker, and the whole insect has not the violet so diffused as in *S. præcipua*, while the markings are different and less conspicuous in relief.

Family ENNOMIADÆ.

LAGYRA FLACCIDA, sp.nov.

♂. 30 mm, ♀. 36-52 mm. Head, palpi, thorax, and abdomen black tinted with violet-grey. Antennæ black, pectinations in ♂ grey. Forewings triangular, broadly dilate, costa rounded, apex rounded and prolonged, hindmargin deeply scooped out beneath apex, thence rounded and slightly crenulate; violet-slate coloured and banded with black; in ♂ rather a blue-grey or a violet diffused with ochreous; a darker broad black band at base; a broad band immediately beyond posterior border from $\frac{1}{3}$ costa to $\frac{1}{4}$ inner margin, bowed in costal half; a conspicuous broad median fascia, darker on either border, occupying the third fourth of the wing, posterior border rounded in centre, waved, a submarginal line at $\frac{5}{6}$ diffused with shaded black more or less to hindmargin, hindmarginal line deep black: cilia black tipped with grey or white. Hindwings with the colour, markings and fascia as in and continuous with those of forewings; cilia as in forewings.

Geraldton, Johnson River (Messrs. Meek and Barnard).

Allied to *L. Talaca*, Walk.

Family EROSIIADÆ.

EROSIA CONSCRIPTA, sp.nov.

♂♀. 14-16 mm. Head ochreous-grey. Palpi light fuscous-grey. Antennæ silvery-grey. Thorax and abdomen light grey. Forewings broadly dilate, costa straight, apex rounded, hindmargin gently rounded, light grey, dusted with fuscous and marked with dark fuscous lines and spots; costa dotted along its entire length; a circular line of dots from $\frac{1}{3}$ costa to $\frac{1}{3}$ inner margin; a second line from $\frac{2}{3}$ costa arches toward hindmargin, and below median vein is angled as a fine line to a conspicuous blotch on $\frac{2}{3}$ inner margin ; a hindmarginal band of interrupted dots and blotches is diffused into two thin lines on inner half of wing: cilia grey. Hindwings as forewings, hindmargin sharply angled below apex and before middle ; a row of dots along inner border ; a second row parallel and along submedian ; a wide V rests near costa at $\frac{1}{3}$ and touches costa at $\frac{3}{5}$, apex being produced along median vein ; between this and anal angle a conspicuous angular blotch, and beyond it toward hindmargin an arrow-head line, subtending a crenate black hindmarginal line ; cilia as in forewings.

Geraldton (Messrs. Meek and Barnard).

Conspicuous by its hieroglyph on hindwings ; allied to *E. stolida*, Butler.

Group PYRALIDIDÆ, Family EPIPASCHIADÆ.

STERICTA ÆRUGINOSA, sp.nov.

♀. 23 mm. Head, palpi and thorax coppery-green freely dotted with grey and greenish-black, thorax anteriorly tinted with copper-red. Antennæ greenish-fuscous. Abdomen fuscous-grey, segments divided by copper-fuscous dorsal lines which in middle segments become broken into a central dot and suffusion on either side. Forewings oblong-obovate, costa nearly straight, apical half gently rounded, apex scarcely pointed, hindmargin gently rounded, bright copper-green freely marbled and irrorated with lighter and dark greens and shades of fuscous, and containing a large triangular patch from a base $\frac{1}{5}$ to anal angle of inner margin to an apex at $\frac{2}{3}$ costa of copper-red freely marbled with dark green and fuscous, veins lighter green ; a black-green dot near base, and continuous with a line of black-green dots more or less suffused, along median vein to $\frac{1}{3}$, thence as a shading more or less distinct along median to hindmargin ; a black-green dot at $\frac{1}{8}$ costa reaching but scarcely touching median ; a black-green line from $\frac{1}{3}$ costa to $\frac{1}{3}$ inner margin, twice deeply dentated outward in costal half ; a black-green band bordering inner margin to $\frac{1}{4}$, thence bending at an obtuse angle and continued until it meets the transverse bar just before costa; a dark green spot at $\frac{2}{3}$ costa breaking up into two bands, the anterior reaching to $\frac{3}{4}$ inner margin and crossed in the middle by a diffused black-green blotch bordered with copper-red, the posterior branch very denticulate, and extending to $\frac{3}{4}$ hind-margin; it is bordered by a light green on either side and suffused into a coppery patch at and filling the whole anal angle; a hind-marginal row of black-green dots, barred by a shading of copper-fuscous: cilia copper-fuscous banded and barred with fuscous. Hindwings fuscous, with darker fuscous on veins and darker towards hindmargin but scarcely forming a hindmarginal band; cilia copper-red tinted with pink and barred and banded with fuscous.

Brisbane; a pair bred by Mr. Illidge in 1892.

Family PYRALIDÆ.

BALANOTIS FERRUGINEA, sp.nov.

♂. 39 mm. Head iron-grey, eyes green, black in posterior lower third. Palpi iron-grey. Antennæ grey, very finely lined with black and white, cilia grey. Thorax grey, richly variegated with white and black, three white spots on either side of central line of dorsum, collar iron-grey, a brush of long ochreous hair spreading out from underside from fore part of thorax. Abdomen black, base variegated with white, segments narrowly and sparingly based with white at sides, caudal appendage ochreous, extreme point black. Legs iron-grey, tibiæ and tarsi lined with ochreous-white. Forewings elongate, narrowly dilate, costa slightly wavy, hindmargin rounded, fuscous, marbled with shades of fuscous-black and grey; a black linear fascia from $\frac{2}{5}$ costa to $\frac{1}{3}$ inner margin; costal half of wing for $\frac{1}{3}$ of depth black; a conspicuous apical patch marbled black and fuscous; spots on inner margin and a diffused arch of spots in middle third of inner margin black and marbled with fuscous; remainder of wing lighter, being more or less marbled with grey and white; hindmarginal line fuscous-ochreous : cilia fuscous-grey, with a median ochreous line, finely barred with black. Hindwings ferruginous, with a broad hindmarginal black border, narrowing acutely and sharply to a diffused line at $\frac{1}{2}$ hindmargin to just before anal angle; hindmarginal line fuscous-ochreous; cilia as in forewings.

Brisbane; two specimens.

SYNTONARCHA VULNERATA, sp.nov.

♂♀. 16-22 mm. Head light ochreous-fuscous, in some specimens ferrous-fuscous on crown. Palpi ferrous-fuscous. Antennæ ochreous to ferrous-fuscous. Thorax ochreous-fuscous, in some specimens stained with ferrous-fuscous or sanguineous. Abdomen ochreous-fuscous, in some specimens ferrous-fuscous anteriorly. Forewings elongate-obovate, costa gently rounded, hindmargin rounded, thinly scaled toward inner margin, so much so as to form a conspicuous semi-hyaline arch, ochreous-fuscous; this is arched over by a ferrous-fuscous or sanguineous band which covers basal third of inner margin, base of wing, costal band to $\frac{2}{3}$ and thence as an oblique band to anal angle; a very dark blotch resembling a dried blood stain from inner margin just before $\frac{1}{2}$, more or less obliquely to near, but not touching, costal band; a dark blotch from anal angle more or less diffused to costa at $\frac{4}{5}$; a small dark discal spot near costal band at $\frac{2}{3}$; in some specimens the veins are dark ferrous-fuscous; hindmarginal line ferrous-fuscous: cilia pearly-ochreous. Hindwings hyaline, with a hindmarginal narrow line of ferrous-fuscous; cilia as in forewings.

Brisbane; at electric light; very rare.

This species is very variable, chiefly a light form and a dark form according to the development of the ferrous-fuscous scales. It has the appearance on the dark type variety of being smudged with dried up blood stains.

Family HYDROCAMPIDÆ.

PARAPONYX PUDICA, sp.nov.

♂♀. 12-14 mm. Head, palpi and thorax snowy-white. Antennæ white, ochreous toward tips. Abdomen white, base of segments ochreous. Forewings with costa straight, rounded at base and apex, hindmargin rounded, wavy, snowy-white with ochreous-drab and fuscous lines and suffusions; a circular line near base to near inner margin; a second circular line from ¼ costa to ¼ inner margin, and continuous over ⅔ hindwing; a short oblique line from costa at ½, and immediately beneath posterior end a kidney-shaped figure with a white centre and smoky-grey nucleus; a narrow line beneath this to ½ inner margin and through hindwing to ½ inner margin; a triangle at ¾ costa, and a broad band immediately beneath; beyond these posteriorly is a line of ground-white sinuous outward toward apex and inward toward inner margin, bordered anteriorly by a light-ochreous-drab line and posteriorly by a darker line, suffused in the pockets; a parallel suffusion of ochreous-drab on hindmargin separated by a similar line of snow-white: cilia white, tinted and mixed with ochreous-drab. Hindwings as forewings, a round discal dot beyond 2nd line; a third line dentate and denticulate; a broad hindmarginal suffusion of ochreous-drab, with a short faint line of white along inner margin to opposite anal angle; cilia as in forewings.

Geraldton (Messrs. Meek and Barnard).

Family BOTYTIDÆ.

GLYPHODES LINEATA, sp.nov.

♂♀. 30-35 mm. Head grey, orbital rims and tongue white. Palpi black, terminal joint light grey. Antennæ ochreous-grey. Thorax chocolate-fuscous, becoming chocolate-black laterally, with seven whitish-grey lines, one on dorsum and three at equal distances on either side. Abdomen chocolate-fuscous, posterior segments vermilion-red tinted with gold, five whitish-grey lines, one on dorsum and two at equal distances on either side, caudal appendage in ♂ black, anal segment of ♀ vermilion-red, narrowly edged with black. Forewings elongate, moderately dilate, costa straight, apical fourth rounded, hindmargin obliquely rounded beyond centre, chocolate-fuscous tinted with velvety-black and interlined with vermilion-red lines bordered by rich black bands running as a rivulet in and out between and around all markings; a circular white line from costa near base to ⅛ inner margin; a second immediately beyond diffused with vermilion-red toward inner margin; a 3rd inversely circular to the 1st from ¼ costa to ⅓ inner margin varying in colour from white to red; a triangle of white with its base from ¼ costa to immediately beyond, and reaching in ♂ to ½, and in ♀ to ¾, across wing toward inner margin, bordered by a linear band of rich velvety chocolate-black; a second and larger triangle of white having its base ½ to near ¾ costa, and its apex ½ toward inner margin; between the two triangles a decanter-shaped figure of black lined with blue-grey and bordered with vermilion-red, the figure and triangle being both bordered by the continuous black band; immediately beyond 2nd triangle is a red line passing obliquely to ¾ inner margin, bordered posteriorly with a black line edged with white on and near costa and suffused blue-grey toward inner margin; the portion beyond this plain rich groundcolour; an ochreous hindmarginal line: cilia black tipped with silver-grey, a patch for ⅓ of hindmargin just beyond anal angle silver-white. Hindwings coloured and marked as forewings, with inner margin becoming light ferruginous; a large white triangle in middle third of costa to ½ toward inner margin; two lines of white from near base on costa half-way to hindmargin, where they are diffused into groundcolour; three linear bands of vermilion-red beyond triangle, separated by rich black lining, centre line tinted with blue-grey; a line of white immediately beyond extends through middle of wing; a rich border of dark chocolate-black is edged with hindmarginal ochreous line; cilia as in forewings with a silver-white patch in middle third.

Geraldton, Johnson River (Messrs. Meek and Barnard).

DIPLOTYLA MEEKII, sp.nov.

♂. 19-22 mm. Head fuscous-black, orbital rims ochreous-fuscous. Palpi black. Antennæ fuscous, portion beyond tuft whitish-grey. Thorax fuscous-black. Abdomen fuscous-black, with a small ochreous spot on præcaudal segment, and caudal segment tipped with light ochreous. Legs fuscous-black, banded with ochreous. Forewings elongate-triangular, costa moderately sinuate, hindmargin rounded, fuscous-black; three crenulate fuscous lines bordered with black, more or less distinctly defined, 1st at $\frac{1}{8}$ costa to $\frac{1}{4}$ inner margin, 2nd more or less interrupted, from near costa at $\frac{3}{5}$ to $\frac{3}{5}$ inner margin, 3rd from $\frac{4}{5}$ costa to $\frac{3}{4}$ hindmargin; a small ochreous dot beyond 1st line near costa, a larger ochreous spot on anterior border of 2nd line near costa; a small light fuscous-ochreous dot on costa at $\frac{3}{4}$; a fine hindmarginal fuscous-ochreous line: cilia black with a median fuscous-ochreous band. Hindwings as forewings, with two faintly marked fuscous-ochreous lines, the first from $\frac{1}{2}$ costa to anal angle, the second from $\frac{7}{8}$ costa parallel with hindmargin as far as $\frac{2}{3}$; cilia as forewings.

Geraldton, Johnson River (Messrs. S. Meek and Barnard).

Allied to *D. ochrosema*, Meyr.

REHIMENA DIVISA, sp.nov.

♂♀. 19-25 mm. Head ochreous-drab, crown streaked with pale lemon. Palpi fuscous-drab. Antennæ fuscous-drab mingled with white toward base. Thorax purple-fuscous, with ochreous over collar, and a grey-white band on dorsum. Abdomen fuscous, with fuscous-grey fringing segments, anal segment tipped with ochreous. Legs purple-fuscous, banded with white. Forewings elongate, moderately dilate, costa nearly straight, hindmargin rounded, purple-fuscous, tinted toward hindmargin with drab scales; a triangle of orange-ochreous dividing wing almost equally and bordered by a black line, posterior border sinuous and dentate; a yellow-ochreous spot at $\frac{7}{8}$ costa, suffused along costa into ground-colour; this subtending a submarginal purple-black line sharply turning to hindmargin just before anal angle; this line dividing off a hindmarginal band which is diffused with creamy-drab between veins; a light hindmarginal fine line with a row of black dots: cilia creamy-grey. Hindwings fuscous-grey, veins darker, with a lighter ochreous-grey suffusion toward base; cilia creamy-grey.

Geraldton (Messrs. Meek and Barnard).

Group TINEINÆ, Family XYLORYCTIDÆ.

Pilostibes tecta, sp.nov.

♂♀. 25-28 mm. Head ashy-grey, irrorated with black, face lighter grey. Palpi grey, 2nd joint thickened with dense grey and black scales. Antennæ grey, annulated with black. Thorax ashy-grey, finely irrorated with black, and with a tuft of white hairs fuscous at the base posteriorly on either side. Abdomen light fuscous, very finely irrorated with black. Forewings elongate-oblong, costa moderately arched, apex obtuse, hindmargin gently rounded, slaty-grey, becoming ashy-grey toward base and basal half of costa, finely and profusely pencilled with black, a row of conspicuous black spots on median, 1st near base, 2nd at one-third, and 3rd at two-thirds, a row of three inconspicuous black dots on costa at $\frac{3}{5}$, $\frac{2}{3}$ and $\frac{3}{4}$: cilia slaty-grey with base having a fuscous tint. Hindwings fuscous-grey; cilia light fuscous-grey with darker basal band.

Duaringa (Mr. Barnard).

Pilostibes stigmatius, Meyr.

Brisbane; two specimens, beaten from trees.

Cryptophaga nubila, sp.nov.

♂♀. 30-42 mm. Head, palpi and thorax white. Antennæ white, with fuscous pectinations in ♂, ciliated in ♀. Legs white, posterior tarsi with base of joint black. Abdomen with a red spot on second segment bordered with white; first segment in ♂ grey, but covered with fringe, two tufts of white hairs; in ♀ segment white; hind segments in ♂ grey, thickly diffused with black and ashy-grey; in ♀ light grey bordered with white. Forewings elongate, costa very gently rounded, hindmargin rounded, grey-white freely irrorated with smoky-black scales, veins smoky-grey; a suffusion of smoky-black all round disc leaving disc a grey-white as groundcolour; a like suffusion on inner border leaving a narrow strip of groundcolour between it and the darker area of the wing; no distinct discal spot: cilia grey, tinted with smoky-grey. Hindwings in ♂ black, darker on veins, inner margin and base white; a row of black spots on veins almost hidden by groundcolour; in ♀ hindwings white diffused with ashy-grey; streaks of white from base in interneural spaces; veins smoky-grey; cilia white with a smoky line in ♂, in ♀ divided into dots.

Brisbane; reared by Mr. Illidge from larvæ taken on Swamp Mahogany (*Tristania suaveolens*).

CRYPTOPHAGA INTERMEDIA, sp.nov.

♂♀. 28-42 mm. Head, palpi and thorax white. Antennæ in ♂ white, pectinations fuscous, in ♀ white at base, thence finely annulated in middle and becoming black at extremities. Legs white, tarsi with black and white rings. Abdomen in ♂ with first segment white, 2nd dull orange-red, middle segments velvety-black edged with white, and posterior segments edged with long white hairs; in ♀ white, second segment dull orange-red. Forewings elongate, costa in ♂ nearly straight, in ♀ rounded, milky-white, with three black spots, 1st near median at $\frac{1}{3}$, 2nd and 3rd at $\frac{2}{3}$, the costal one slightly anterior—in ♀ the median portion of the wing is covered, and the dots are less easily traced, in numerous short black pencillings; a row of black spots on apical fifth and along hindmargin: cilia white, with darker basal band. Hindwings in ♂ black, darker on veins, inner border white variegated with a few grey hairs, in ♀ white, veins smoky-black, and a diffusion of black along veins and over the hindmarginal area of wing, dots on hindmargin in ♀ large and conspicuous, in ♂ almost obscured; cilia white with smoky band at base.

Var. *alba*.

♂. Forewings snow-white, hindwings as type.

♀. Forewings snow-white with three small dots, hindwings pure white.

Brisbane; reared by Mr. Illidge from larvæ taken on *Tristania suaveolens*.

CRYPTOPHAGA FLAVICOSTA, sp.nov.

♂♀. 28-38 mm. Head ashy-grey. Palpi whitish-grey. Antennæ fuscous, becoming ashy-grey at base. Thorax slaty-grey, becoming ashy-grey anteriorly. Abdomen slaty-grey, posterior segments in ♂ copper-red bordered with rich velvety-black, in ♀ slaty-grey banded with narrow lines of black and fuscous-red. Legs orange-red inclining to ferrous. Forewings elongate, moderate, costa scarcely arched in ♂, slightly arched in ♀, apex obtuse, hindmargin slightly rounded, somewhat oblique, rich slaty-grey, becoming ashy-grey toward basal portion of costa; an orange-red costal band, more brown-red in ♀ and with a rich black velvety patch in apical angle: cilia slaty-grey, with indistinct fuscous bands. Hindwings fuscous-grey; cilia as forewings.

Brisbane; bred by Mr. Illidge in Nov., 1892, from *Eucalyptus eugenioides* and *E. corymbosa.*

CRYPTOPHAGA PORPHYRINELLA, Walk.

Brisbane; bred from *Exocarpus Cunninghami (?)*

CRYPTOPHAGA ECCLESIASTIS, Meyr.

Brisbane; bred by Mr. Illidge from *Eucalyptus corymbosa.*

XYLORICTA TINCTORIA, sp.nov.

♂♀. 24-26 mm. Head, thorax and abdomen creamy-grey; thorax darker posteriorly. Palpi and antennæ light ochreous-fuscous. Forewings creamy-white, costa light, a patch near base reddish-grey, a patch on inner margin in 2nd and 3rd fourth ferruginous-red, more or less suffused or tinted into groundcolour toward costa at apex; a fine inconspicuous line at $\frac{3}{4}$: cilia dark grey. Hindwings creamy-white; cilia light grey.

Brisbane; one specimen taken at light in 1891; Dr. Turner has this year beaten five or six specimens from *Eugenia*, on the stems of which it probably feeds.

XYLORYCTA STERCORATA, sp.nov.

♂. 30 mm. Head and palpi white. Antennæ white at base, becoming greyer toward apex. Thorax white, with a conspicuous dorsal patch of fuscous, varied by shades of purplish-grey, white and fuscous and spreading laterally posteriorly. Abdomen white, 2nd segment reddish-fuscous and loosely covered with white hairs. Legs white. Forewings elongate, gently dilate, costa gently rounded, hindmargin nearly straight; white, with a number of pale leaden-coloured spots imitative of birds' droppings; an acute spot in centre and a splash tinted with ferrous in inner angle of base; a triangular blotch at $\frac{3}{5}$ costa; five round spots, 1st near costa at $\frac{1}{8}$, 2nd obliquely to 1st and posterior, 3rd before middle in centre of wing, 4th at $\frac{3}{4}$ of wing, 5th in a line with 4th but nearer to costa; two sharp dots arranged diagonally with 1st and 2nd spots; four dots forming a rhomboid figure at $\frac{3}{5}$, the two hinder ones tinted with purplish-black; an obscure dot on hindmargin at $\frac{5}{6}$, and another half-way between this and apex; three rows of fine hindmarginal spots: cilia white. Hindwings and cilia white.

Brisbane; bred from *Elæocarpus obovatus*: also one specimen at light.

As this species rests closed up on the leaf, it looks exactly like a bird's dropping.

MAROGA UNDOSA, sp.nov.

♂♀. 30-36 mm. Head and thorax light slaty-grey, in ♀ tinted with copper colour. Palpi black, tipped with white. Antennæ black in basal third, black and white annulated in middle, and white in apical third. Legs black, anterior coxæ snow-white, posterior pair copper-coloured. Forewings elongate, gently dilate, costa in ♂ prominently bowed at $\frac{3}{5}$, in ♀ more arched, scooped out before apex, apex produced and rounded, hindmargin scooped under apex, rounded in anal half; in ♂ light greenish-copper, with a median irregular band, and a suffused anal hindmarginal patch tinted with creamy-ochreous; in ♀ with a groundcolour of copper shaded on borders with fuscous; a black discoidal spot at $\frac{2}{3}$ close to median; a dark fuscous line of shading on apex and apical half of hindborder, and a thin fuscous line along middle $\frac{2}{4}$ of inner border: cilia dark fuscous in apical half, light ochreous in anal half. Hindwings reddish or coppery-fuscous; cilia coppery-red, fuscous on apical fourth.

Brisbane; three specimens reared by Mr. Illidge.

CATORYCTIS NONOLINEA, sp.nov.

♂. 14 mm. Head whitish-ochreous. Palpi ochreous, terminal joint tinted with fuscous. Antennæ white annulated with fuscous. Thorax whitish-ochreous, with a faint fuscous line laterally and posteriorly. Abdomen light fuscous-ochreous. Forewings elongate, costa gently arched, apex obtuse, hindmargin oblique, rich chocolate-fuscous with ochreous-silvery lines; a slender attenuated streak immediately beneath costa from base to $\frac{2}{5}$, a thin line immediately beneath this at $\frac{2}{3}$ running obliquely to $\frac{2}{3}$ costa, two short thin lines immediately beyond this and parallel, a short arrow-head line immediately beyond broadening in apical angle to apex, with a tendency to divide at apex, a moderately broad straight line from just before middle of wing to $\frac{1}{3}$ hindmargin, with a tendency to divide before hindmargin, a narrower line immediately beneath and parallel to this imperfectly divided on hindmargin, a moderately broad streak from inner margin at base to anal angle, with a similar line parallel and close to inner margin: cilia light fuscous with base more or less ochreous. Hindwings light shining ochreous, with a fuscous cloudy suffusion at apical angle narrowing to a point opposite middle of hindmargin; cilia ochreous.

Brisbane (Mr. Illidge); taken on *Casuarina suberosa.*

Near to *C. subnexella,* Walk.

CATORYCTIS MEDIOLINEA, sp.nov.

♂. 22 mm. Head and palpi whitish-ochreous. Antennæ finely white and black annulated. Thorax ochreous, white on dorsum. Abdomen ochreous. Forewings with costa rounded, whitish-ochreous with fuscous bands on veins; a broad median snow-white band from base narrowing sharply to a point at $\frac{5}{6}$: cilia ochreous. Hindwings light ochreous; cilia ochreous.

Brisbane (Mr. Illidge).

SOME NEW SOUTH WALES PLANTS ILLUSTRATED.

By R. T. Baker, Assistant Curator, Technological Museum, Sydney.

(Plate v.)

No. v. Angophora subvelutina, F.v.M.

"A tree attaining a considerable size, with a rough persistent bark as in *A. intermedia, of which F. v. Mueller now thinks it may be a variety.* Foliage and young shoots glaucous or *minutely pubescent*, with often a few bristles on the flowering branches and inflorescence. Leaves sessile or nearly so, ovate or ovate-lanceolate, mostly acute, all (excepting rarely the upper ones) cordate at the base with rounded auricles as in *A. cordifolia*, 2 to 4 in. long, the veins numerous, but not usually so much so nor so fine as in *A. intermedia.* Flowers small, in loose corymbs, precisely as in *A. intermedia.* Fruiting calyxes 3 to 4 lines in diameter." (B.Fl. iii. p. 184.)

The object in studying this species was to see if additional research would throw any further light on its relative position,—whether the examination of complete material would add anything in favour of its specific rank; or if it might prove to be only a variety of its congener *A. intermedia,* as surmised by Baron von Mueller and mentioned *en passant* by Bentham.

Of all the leaves examined, the shape and venation were in every case quite different from *A. intermedia.* The inflorescence seemed invariably pubescent, although Baron von Mueller's specimens were minutely so, while that of *A. intermedia* was found in the many specimens examined to be consistently glabrous.

Besides the points noted above, *A. subvelutina* differs from *A. intermedia* in having two forms of leaves—*sessile* cordate and *petiolate* ovate-lanceolate—and both occurring on the same tree, a characteristic feature not previously recorded, I believe.

The seed now depicted for the first time accords in every point with the generic description of Bentham.

Localities.—Richmond, Grose River, Booral; northward to Richmond River, southward to Twofold Bay.

EXPLANATION OF PLATE V.

Fig. 1.—Flowering specimen (nat. size).

Fig. 2.—Section of flower (enlarged).

Fig. 3.—Front and back views of a stamen (enlarged).

Fig. 4.—Fruit capsule, also in section and showing valves (nat. size).

Fig. 5.—Seed (nat. size).

THE SILURIAN TRILOBITES OF NEW SOUTH WALES, WITH REFERENCES TO THOSE OF OTHER PARTS OF AUSTRALIA.

By R. Etheridge, Junr., Palæontologist to the Australian Museum, and Geological Survey of N. S. Wales, and John Mitchell, Public School, Narellan.

Part II.—The Genera Proetus and Cyphaspis.

(Plates vi.-vii.)

Genus Proetus *(continued)*.

Since the appearance of our first paper* on the Silurian Trilobites of N. S. Wales, certain disjointed pygidia, glabellæ, and other portions of cephalic-shields have attracted attention in the Australian Museum Collection. These are from the black Cave Limestone, of Cave Flat, Murrumbidgee, and were collected by Mr. Charles Jenkins, L.S. Although not sufficiently complete to enable us to give a detailed description, or to warrant the proposal of a specific name, they yet appear distinct from either of those characteristic of the Bowning Series, and are of interest as showing the existence of *Proetus* at a higher stratigraphical horizon than previously surmised.

The fossils in question consist of portions of glabellæ, pygidia, and a free cheek or two. On the glabella the edge of the limb is very finely concentrically lined, and the surface of the glabella itself minutely granular. The pygidum has a pronounced axis of seven rings, each bearing a row of tubercles. The pleuræ consist of four or five coalesced segments.

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* P.L.S.N.S.W. 1892, vi. (2), pt. iii. p. 311, t. 25.

Genus CYPHASPIS, Burmeister, 1843.

(Organ. der Trilob. p. 103.)

CYPHASPIS BOWNINGENSIS, Mitchell (Pl. VI. figs. 3, *3a-h*; Pl. VII. figs. *3i-k*).

Cyphaspis bowningensis, Mitchell, P.L.S.N.S.W. 1888, ii. pt. iii. p. 418, t. 16, f. 3.

Sp. Char.—Body oval. *Cephalic-shield* subsemicircular, strongly inflated; limb wide with thickened margin, usually abruptly deflected; glabella pyriform or including the circumscribed lobes suboblong, tumid, granulated distinctly; glabellar furrows in many specimens not visible, but in some the two anterior ones are present, and are short and faint; axial furrows distinct and continuous anteriorly round the front of the glabella; circumscribed lobes separated from the glabella by deeply incised furrows, ovate or obpyriform, prominent, inflated; fixed cheeks tumid, granulated; eye lobes in flattened specimens large; free cheeks moderately large, strongly inflated towards the eye, no granulation observed; genal angles produced into spines reaching to and including the sixth segment of the thorax, and curving out from the body; facial sutures anteriorly weakly directed outwards till reaching the thickened edge, then sharply incurved, passing out in a line with the inner side of the eyes, posteriorly sharply curving outwards, cutting the posterior margin of the side lobes at their extremities; eyes subcrescentic or subreniform, large, facets not observed; neck furrow distinct, continuous across side lobes; neck ring robust, arched, posterior facet strongly granulated; central granule most robust. *Thorax* consisting of twelve segments; axis strongly arched, width equal to that of pleuræ; posterior facet of each segment carrying a row of granules similar to that of the neck ring, gradually diminishing distally, sixth segment bearing a large dorsal spine extending to the extremity of the pygidium; pleuræ grooved, grooves terminating just short of their extremities, abruptly depressed from fulcra, posterior facets carrying a row of granules, distal ends of pleuræ rounded, sutures straight. *Pygidium* subtriangular, small, anterior margin straight and twice as long as axial length of the pygidium; axis prominent, reaching to the posterior margin, subtruncate, divided into three segments; pleuræ composed of two coalesced segments, moderately inflated, margin narrow and thickened, no striation visible.

Obs.—Since the description of this species by one of us, a large addition has been made to our material, which enables us to give fuller specific details. One important feature possessed by some of the specimens, and not present on the original example, is the presence of a large dorsal spine. Different specimens of the head shield show variations in the width of the limb, size of the eye lobe, distinctness and presence of glabellar furrows, and apparent shape of the eye; but all these differences we conclude to be insufficient to establish more than one species. Most of the variations may arise from compression, and the oval impression left in some cases where the eye has been broken off are treated as accidental. As we are unable to observe any marked differences between the cephalic shields of those specimens with dorsal spines, and those without that appendage, it has struck us that this feature may be no more than a sexual characteristic.

C. bowningensis is closely allied to *C. Burmeisteri*, Barr.,* but is longer in proportion to its width, and seems to have a much more attenuated pygidium and thoracic axis. In addition there is the possibility of glabellar furrows. In dealing with small and often ill-preserved remains such as these, it is sometimes difficult to be certain what is pure structure or what may be the result of pressure. If the apparent glabellar grooves sometimes observable in *C. bowningensis*, such as are shown in Pl. VI. fig. 3*f-g*, be truly of that nature, they would tend to place the species near the genus *Phætonides*, Angelin.† The ovate character of the entire test is one in which notably the present species and also our *C. Horani*, agree with several American species of the Hamilton Group.

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* Syst. Sil. Bohême, 1852, i. p. 484, t. 18, f. 61-71.

† See Hall, Pal. New York, 1888, vii. p. xlv.

We have not noticed any trace of fimbriate pygidia in any Australian *Cyphaspis.*

Loc. and Horizon.—Bowning, Co. Harden—Upper and Middle Trilobite beds; Limestone Creek, near Bowning, Co. Harden—Middle Trilobite bed, Bowning Series (? Wenlock) *(Coll. Mitchell).*

The majority of the specimens figured are from the Upper Trilobite bed, but many cephalic-shields, two of which are figured, were obtained from the Middle Trilobite bed (Pl. VI. fig. 3*h*, 3*j*). The latter we are not able to separate from those of the former; and therefore, like *Proetus bowningensis* and *Acidaspis longispinis,* this species was one of the most persistent Trilobites of that geological age.

CYPHASPIS YASSENSIS, *sp.nov.* (Pl. VI. figs. 1, 1*a-d*).

Sp. Char.—Entire body unknown. *Cephalic-shield* semicircular, with a wide somewhat concave limb, the edge reflected upwards and thickened; glabella pyriform, arched in the middle line, narrowing rapidly towards the posterior, with a wide anterior border, axial furrows very marked towards the front, less so in the middle of their course and behind; first pair of glabellar furrows somewhat indicated by a slight lateral compression on each side of the glabella; circumscribed lobes small, oval; facial sutures anterior to the eyes gently directed outwards, curving inwards along the limb and cutting it nearly in lines opposite the original point of departure from the eyes, posterior to the eyes very short, cutting the hinder margin of the cephalic-shield close to the glabella; neck furrow moderately distinct, depressed on each side; fixed cheeks small; eyes large, reniform, and faceted; eye lobes moderately large, semicircular; free cheeks large, very tumid towards the eyes; genal angles produced into comparatively large and gently incurved spines, their limbs striated; supposed auditory organs situated between the front margin of the glabella and the facial sutures. *Thorax* only known by disjointed segments, but with a very prominent axis; pleuræ distinctly furrowed, the furrows terminating just short of the distal ends, which are rounded. *Pygidium* semielliptical; axis distinct, terminating below in a tolerably sharp apex; first three segments distinct, others less so, the last two or three becoming very faint; pleuræ of five coalesced segments, the anterior pair perceptibly furrowed, the second and third pairs faintly so; they terminate at the margin; limb striate.

Obs.—*Cyphaspis yassensis* is remarkable in possessing features that distinguish several genera of Proetidæ. Its wide limb, and particularly the wide anterior glabellar border, relate it to *Arethusina;* its pyriform and tumid glabella allies it as strongly to *Cyphaspis;* whilst, on the other hand, the proximity of the eyes to the glabella and the small fixed cheeks are characteristic of *Proetus.* The pygidium also approaches the latter type; but even the glabella is narrower and more pyriform than is generally seen in *Cyphaspis.*

The glabellar furrows are as a rule not observable, but in one fairly well preserved head-shield all three pairs are faintly visible.

Amongst Australian Trilobites this species is the only one in which the supposed auditory organs have been observed, and on that account is of more than ordinary interest. The occurrence of these pores, usually one on each side of the glabella, either in the axial grooves or at any rate close to them, has been noticed in several genera by various writers. The question has been summed up by Dr. H. Woodward,* who after instituting a comparison with the living genus *Serolis,* believes that the pores in question may represent either a simple eye, a tympanum, or an olfactory organ; but it is still an open question which of the three is the most probable. Such pores have been seen in the genera *Trinucleus, Ampyx, Griffithides, Phillipsia, Acidaspis, Calymene, Cheirurus,* and to these we can now add *Cyphaspis.* In our Trilobite the pores, or, from our specimens being denuded of the test, papillæ, are not situated in the facial sutures, but between them and the front rounded border of the glabella.

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* Mon. Brit. Carb. Trilobites (Pal. Soc.), 1884, pt. 2.

Cyphaspis yassensis is also remarkable for the great lateral expansion of the cephalic-shield, as compared with the central portion or glabella. This, with the general contour and the wide anterior glabellar border (limb), strongly reminds us of the genus *Arethusina.*

Loc. and Horizon.—Belle Vale, between Bowning and Yass, and at Bowning, Co. Harden—Lower Trilobite bed, Bowning Series (? Wenlock) *(Coll. Mitchell).*

CYPHASPIS HORANI, *sp.nov.* (Pl. VII. figs. 4, 4*a-c*).

Sp. Char.—Body oval. *Cephalic-shield* subsemicircular, highly inflated; limb wide, divided into two almost equal parts, of which that immediately in front of the glabella is subtumid and conspicuously granulated, anterior part concave, edge thickened and bearing a row of granules, subcrenated; glabella ovoid or elliptical, very tumid, highly granulated, glabellar grooves not present, axial furrows deep and continuous in front; circumscribed lobes small, narrow and elongate, close to and somewhat under the sides of the glabella; fixed cheeks fairly large, very tumid centrally, granulated, the posterior granule largest; eye lobes large, suboblong-semicircular; free cheeks very inflated, the inflated portion ornamented with several rows of slightly oblique granules, and subcrenulated, margin thickened; genal angles continued into long slender falcate spines embracing and apparently reaching to or near the extremity of the thorax; eyes small, suboval or subcircular, in some specimens very prominent, facets not observed; facial sutures anteriorly comparatively straight, incurving on edge of limb a short distance before passing out, posteriorly sharply curved outwards and cutting the posterior margin of the shield at the extremities of the side lobes; neck furrow deep, wide, strongly arched backward, interrupted by circumscribed lobes and continuing much less conspicuously across lateral lobes; neck ring prominent, intensely arched backward, bearing a row of granules of which the central one is most conspicuous. *Thorax* consisting of ten segments, length equal to width, apparently highly granulate; axis prominent, proximal portion for six segments equal in width to side lobes, from sixth segment diminishing gradually, well preserved specimens with a row of three or more granules on each segment, no dorsal spine observed; pleuræ straight and flat to fulcrum, distal ends sharply deflected and slightly separated, deeply grooved, grooves terminating short of the extremities, the posterior facets of each pleura with a row of granules, of which that on the fulcrum is most prominent and persistent, appearing on the pleuræ of the pygidium also, axial furows conspicuous. *Pygidium* small, strongly granulated; axis small, consisting apparently of three segments, divisions of the pleuræ the same, axial furrows distinct; margin thickened.

Obs.—This is rather a minute Trilobite, the largest of our specimens not exceeding three-eighths of an inch, and it is difficult to determine the exact number of thoracic segments; but we believe ten to be correct.

The distinctive features of this species are its ovoid and tumid glabella, very tumid cheeks, granulated ornamentation of the whole test and particularly of the glabella and free cheeks, small eyes, flatness of the pleuræ between their proximal ends and the fulcrum, and their shortness from the fulcrum to the distal ends. It differs so widely from the other species described in the present paper that comparison is unnecessary.

In some specimens the granules of the glabella are arranged in tolerably regular longitudinal rows, in others this is not so conspicuous. The normal shape of the eyes we believe to be round or subconical; but our specimens show them of various shapes. In the larval form the eye is very small, and the specimens are almost invariably in a rolled state.

This very peculiar form of *Cyphaspis* is allied to *C. cerberus*, Barr.,* and *C. Davidsoni*, Barr.,† by reason of its subcrenate anterior cephalic border, but in both the species named the border becomes absolutely serrate, while our best preserved specimens are only faintly so. Still more closely resembling our species is *C. ornata*, Hall,* from the Hamilton Group of New York State, in which the thickened edge of the pustulose anterior border is granular-crenate without being fimbriate.

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* Syst. Sil. Bohême, 1852, I. p. 489, t. 18, f. 49-51.

† Syst. Sil. Bohême, 1852, I. p. 489, t. 18, f. 54-56.

We have named the species after Mr. Joseph Horan, who has been the companion of one of us on many pleasant excursions.

Loc. & Horizon.—Bowning Creek, Bowning, Co. Harden—Lower Trilobite bed; Belle Vale, near Bowning, in the Lower Trilobite bed; and on Great Southern Road near cemetery, Bowning—Middle Trilobite bed, Bowning Series (? Wenlock).

All the specimens figured are from the Lower Trilobite Bed, Bowning Creek (*Coll. Mitchell*).

CYPHASPIS ROTUNDA, *sp.nov.* (Pl. VI. figs. 2, *a* and *b*).

Sp. Char.—Body oval. *Cephalic-shield* subsemielliptical, proportionately large, the axial measurement equal to that of the thorax and pygidium combined, whilst the width is equal to its own axial measurement and that of the thorax combined; limb wide, and concave in front of the glabella, margin thickened. Glabella ovate, short, a pair of glabellar furrows (probably the median) faintly indicated; circumscribed lobes small, oval, oblique in position, very slightly truncate behind; axial furrows moderately defined in front, and continuous round the glabella; facial sutures anterior to the eyes tolerably straight, or slightly inclined outwards, thence incurving along the thickened edge of the limb, and cutting the latter in a line with the sides of the glabella, whilst posterior to the eyes the sutures curve outwards, cutting the posterior margin of the shield at about one-third the distance between the axial furrows and the lateral margins; fixed cheeks small; free cheeks large, tumid, with a wide limb, flat and striate; genal angles produced into strong spines, which embrace the first three thoracic segments; neck furrow wide; neck ring narrow, moderately arched backwards. *Thorax* of eight segments, the transverse measurement being about twice the axial length; axis prominent, width nearly equal to that of the pleuræ, segments

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* Pal. New York, 1888, p. 490, vii, t. 21, f. 1.

arched backwards laterally and forwards in the middle line; thoracic spine absent; axial grooves well marked; pleuræ straight, flat above, distal ends sharply bent downwards, furrows wide and barely reaching the outer margin. *Pygidium* small, transversely elongated, widely triangular, its transverse measurement three times that of the axial length; coalesced segments of the pleuræ invisible; axis prominent, short, truncated posteriorly, of seven or eight segments, the terminal ones very close together; limb very abruptly depressed, flat.

Obs.—This little Trilobite, in its short pyriform glabella and circumscribed lobes, assumes the habit of *Cyphaspis;* the shape of the thorax generally approaches more closely that of the genus *Proetus*, whilst the pygidium in its diminutive size is again of a *Cyphaspis* type. Its rotund appearance at once separates it from the preceding species and the European *C. megalops*, and this separation is further increased by the presence of comparatively short genal spines. From the other Australian species it is distinguished by possessing eight instead of eleven or twelve thoracic segments, the rotund outline, and in the length of the cephalic-shield equalling that of the combined thorax and pygidium. From *Cyphaspis depressa*, Barr.,* *C. Halli*, Barr.,† and *C. Burmeisteri*, Barr.,‡ it is distinguished by having no trace of a thoracic spine, but if there is a possibility of this point of differentiation being of a sexual nature, as previously suggested, the characters mentioned above will serve for the purpose in view, particularly the almost oval shape and closely adpressed genal spines.

Loc. and Horizon.—Bowning, Co. Harden—Lower Trilobite bed, Bowning Series (? Wenlock) *(Coll. Mitchell).*

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* Syst. Sil. Bohême, 1852, i. Atlas, t. 16, f. 38, 39.

† Syst. Sil. Bohême, 1852, i. Atlas, t. 18, f. 35.

‡ Syst. Sil. Bohême, 1852, i. Atlas, t. 18, f. 61.

EXPLANATION OF PLATES.

PLATE VI.

CYPHASPIS YASSENSIS, *Eth., fil., and Mitchell.*

Fig. 1. —Cephalic-shield; a large specimen showing auditory organs (× 3).
Fig. 1*a*.—Pygidium, a large specimen (× 3).
Fig. 1*b*.—Pygidium and two segments of thorax attached (× 3).
Fig. 1*c*.—Cephalic-shield without free cheeks; a well preserved specimen showing no signs of glabellar furrows.
Fig. 1*d*.—Free cheek (nat. size).

CYPHASPIS ROTUNDA, *Eth., fil., and Mitchell.*

Fig. 2. —An almost complete specimen slightly contorted and completely decorticated (× 6).
Fig. 2*a*.—The same restored (× 6).
Fig. 2*b*.—Side view of same (× 6).

CYPHASPIS BOWNINGENSIS, *Mitchell.*

Fig. 3. —Young specimen somewhat contorted and one free cheek missing (× 3).
Fig. 3*a*.—Cephalic-shield and six segments of the thorax, with dorsal spine on the sixth segment, and showing the granular ornamentation distinctly (× 2).
Fig. 3*b*.—Side view of same.
Fig. 3*c*.—Side view of Fig. 3.
Fig. 3*d*.—Portion of thorax, with pygidium and dorsal spine complete.
Fig. 3*e*.—Portion of thorax and spine (× 3).
Fig. 3*f-h*.—Cephalic-shields showing variations; 3*h-j* are from the Middle Trilobite bed and are decorticated and contorted; 3*g* shows a very wide border, and like 3*h-j* indicative of glabellar furrows (× 3).

PLATE VII.

Fig. 3*i-k*.—(*Vide* explanation of 3*f-h*.)

CYPHASPIS HORANI, *Eth., fil., and Mitchell.*

Fig. 4. —Cephalic-shield with one free cheek missing, showing genal spine and very faint serration of anterior edge (× 3).
Fig. 4*a*.—Thorax and pygidium complete and posterior portion of cephalic-shield inverted, decorticated (× 4).
Fig. 4*b*.—Portion of a thorax and pygidium of a smaller specimen than 4*a* (× 6).
Fig. 4*c*.—A very well preserved cephalic-shield without the free cheeks, showing the ornamentation (× 6).

ON A NEW *MUREX* FROM SOUTH AUSTRALIA.

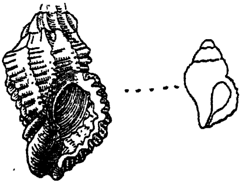
By John Brazier, F.L.S., C.M.Z.S., Lond.

Murex (Pseudomurex) polypleurus, Brazier, n.sp.

Murex pumilus, Angas (*non* Broderip, *nec* A. Adams, *nec* Kuster), Molluscan Fauna of South Australia, Proc. Zool. Soc. London, 1865, p. 158, No. 6.

Murex (Ocinebra) pumilus, Bednall (*non* Broderip, *nec* A. Adams, *nec* Kuster), Transactions and Proceedings and Report of the Royal Society of South Australia, Vol. viii. p. 66, 1884-5 (issued May, 1886).

Shell strong, small, biconical, imperforate, with 8 distinct longitudinal varices or ribs, crossed by fine transverse liræ, the interstices very finely striated or scabrous; whorls 5 to 6 bluntly angulated; suture slightly impressed, smooth; aperture oval, attenuated anteriorly, outer lip thickened by the external varix, with 5 to 6 small nodose teeth within; inner or columellar lip with one small rounded tooth near the canal; colour somewhat grey or flesh colour. Length, 12; breadth, 6 mm. Mouth: length, 4; breadth, 3 mm.



C.H., del.

Hab.—East side St. Vincent's Gulf (*Angas*); MacDonnell Bay, Fowler's Bay (*Professor Tate*); Henley Beach, Semaphore, Aldinga, South Australia (*Professor Tate and W. T. Bednall*); also Port Lincoln (*Bednall*).

This species when found in a living state is very pretty; some specimens are of a fine pink or flesh colour, others again of a dirty grey. Specimens were forwarded to me some time back by my old friend and correspondent Mr. W. T. Bednall as *Murex pumilus*,

A. Ad. The error in the name of this species appears to have originated with Mr. Angas in 1865; if he had taken the trouble to have compared the South Australian shell with *Murex pumilus*, A. Ad., from China, in the British Museum, he would have seen at a glance that they were distinct species. The present species, *M. polypleurus*, Braz., is not in the British Museum, and that on the good authority of my valued friend and correspondent Mr. Edgar A. Smith. *M. pumilus*, A. Ad., is a much narrower and shorter shell, having the canal slightly turned up and crossed by scabrous spiral ridges.

Sowerby in the Thes. Conch. Vol. iv. pl. 400, fig. 200, has enlarged *Murex pumilus* to more than twice the actual length of the shell, and the figure is very coarsely executed. The best figure of it is given by Mr. E. A. Smith in the Report of the Zoological Collection of the Voyage of H.M.S. "Alert," p. 491, pl. 44, fig. D, from Darros Island, Amirantes, in 22 fathoms, on a broken-coral bottom (H.M.S. "Alert"), China Sea (A. Adams).

NOTES AND EXHIBITS.

Mr. Brazier exhibited a specimen of the South Australian *Murex polypleurus*, n.sp., described in his paper, a species which in the past, by the late Mr. G. F. Angas and other authors, has been confused with *M. pumilus*, A. Ad., from the China Sea, and Darros Island, Amirantes. Also a fossil specimen of *M. octogonus*, Q. and G., from New Zealand.

Rev. J. Milne Curran read a note recording the presence of a fossil Buprestid beetle in an earthy limonite at Inverell, N.S.W. The insect is represented by a portion of a metallic green elytron, and it is associated with Miocene fossil leaves and a species of *Unio*. He also showed a specimen of a Silurian fossil coral (*Heliolites*) from Molong, N.S.W., in a beautiful state of preservation.

Mr. Baker exhibited drawings and specimens in illustration of his paper.

Mr. Trebeck showed a specimen of a large freshwater prawn (*Palæmon ornatus*, Oliv.) from the Rewa River, Fiji.

Mr. C. T. Musson sent for exhibition specimens of a European slug, *Arion hortensis*, Müll., introduced with ferns from New Zealand, where it is now not uncommon, though not previously recorded from Australia. Also, from the Kurrajong, N.S.W., specimens of the peculiar slug *Cystopelta petterdi*, Tate.

WEDNESDAY, JUNE 28TH, 1893.

The President, Professor David, B.A., F.G.S., in the Chair.

Mr. L. O. Beal of New Zealand was introduced as a visitor.

Mr. Edgar R. Waite, F.L.S., Australian Museum, Sydney, was elected a Member of the Society.

DONATIONS.

"Société Entomologique de Belgique—Annales." T. xxxiv.-xxxv. (1890-91). *From the Society.*

"Société Zoologique de France—Mémoires." T. v. No. 5 (1892). *From the Society.*

"Société Royale de Géographie d'Anvers—Bulletin." T. xvii. 2e Fasc. (1892-93). *From the Society.*

"Royal Microscopical Society—Journal for 1893." Part ii. *From the Society.*

"Royal Irish Academy—Transactions." Vol. xxx. Parts 1-2 (1892). *From the Academy.*

"College of Science, Imperial University, Japan—Journal." Vol. vi. Part 1 (1893). *From the University.*

"Perak Government Gazette." Vol. vi. Nos. 11-12 (April-May, 1893). *From the Government Secretary.*

"Zoologischer Anzeiger." xvi. Jahrg. Nos. 417-419 April-May, 1893). *From the Editor.*

"Naturwissenschaftlicher Verein zu Bremen—Abhandlungen." xiii. Bd. 3 Heft. (1893). *From the Society.*

"Videnskabelige Meddeleser fra den Naturhistoriske Forening i Kjöbenhavn for Aaret 1892." *From the Society.*

"Zoological Society of London—Abstracts," April 18th, May 2nd and 16th, 1893: "Proceedings, 1892." Part 4: "Transactions." Vol. xiii. Part 5 (1893). *From the Society.*

"Geological Society of London—Quarterly Journal." Vol. xlix. Part 2 (1893). *From the Society.*

"Department of Agriculture, Brisbane—Companion for the Queensland Student of Plant Life." By F. M. Bailey, F.L.S. *From the Author.*

"Natural History Society of Queensland—Report of Council and President's Address for 1892." *From the Society.*

"Victorian Naturalist." Vol. x. No. 2 (June, 1893). *From the Field Naturalists' Club of Victoria.*

"Department of Mines and Agriculture—Records of the Geological Survey of N.S.W." Vol. iii. Part 3 (1893). *From the Hon. the Minister for Mines and Agriculture.*

"Observations of the Transit of Venus, 9th December, 1874." *From the Director, Sydney Observatory.*

"Agricultural Gazette of N.S.W." Vol. iv. Part 5 (May, 1893). *From the Director of Agriculture.*

"Société Scientifique du Chili—Actes." T. ii. (1892), 3^{me} Liv. *From the Society.*

"Bombay Natural History Society—Journal." Vol. vii. No. 4 (1892). *From the Society.*

"Cambridge Philosophical Society—Proceedings." Vol. viii. Part 1 (1892). *From the Society.*

"University of Melbourne—Matriculation Examination Papers" (May, 1893). *From the University.*

"American Museum of Natural History—Bulletin." Vol. v. pp. 33-80 (1893). *From the Museum.*

"Museum of Comparative Zoology at Harvard College—Bulletin." Vol. xvi. No. 12; Vol. xxiv. No. 3 (1893). *From the Curator.*

"American Naturalist." Vol. xxvii. No. 317 (May, 1893). *From the Editors.*

"United States Department of Agriculture—Division of Entomology—Bulletin." No. 29 (1893): "Insect Life." Vol. v. No. 4 (1893). *From the Secretary of Agriculture.*

"American Geographical Society—Bulletin." Vol. xxiv. No. 4 Part 2 (1892); Vol. xxv. No. 1 (1893). *From the Society.*

"Johns Hopkins University Circulars." Vol. xii. No. 105 (May, 1893). *From the University.*

"Canadian Record of Science." Vol. v. No. 5 (1892). *From the Natural History Society of Montreal.*

"Manchester Museum, Owens College—Museum Handbooks." Nos. iii.-v. (1892-93). *From the Keeper of the Museum.*

"Australasian Journal of Pharmacy." Vol. viii. No. 90 (June, 1893). *From the Editor.*

"Contributions to the Anatomy of Fishes. Part ii.—The Air-Bladder and Weberian Ossicles in the Siluroid Fishes." By Professor T. W. Bridges, M.A., and Professor A. C. Haddon, M.A. (1893). *From the Authors.*

PAPERS READ.

NOTES ON AUSTRALIAN COLEOPTERA, WITH DESCRIPTIONS OF NEW SPECIES.

By the Rev. T. Blackburn, B.A., Corr. Mem.

Part XIII.

LAMELLICORNES.

Heteronyx.

In the tabulation of part of this genus, in P.L.S.N.S.W. 1891, p. 488, last two lines on the page, transpose "long" and "wide."

Xynedria, gen.nov., *Pentodontidarum*.

♂. Antennæ 10-articulatæ, flabello mediocri 3-articulato, hujus articulo basali externe setis erectis dense vestito; mentum compressum porrectum; mandibulæ extus rotundatæ porrectæ; clypeus abrupte verticalis, supra ut cornu erectum acutum productus, ad apicem rotundatus modice reflexus; prothorax (exempli typici) a basi ad apicem late profunde excavatus, partis excavatæ lateribus pone medium obtuse elevatis; tibiæ anticæ extus fortiter tridentatæ; femora (præsertim posticæ) valde incrassata; tibiæ posticæ brevissimæ latissimæ fortiter transversim 2-carinatæ; tarsorum posticorum articulus basalis fere cylindricus.

This remarkable *Dynastid* is, I think, near *Pseudoryctes*, with which genus the structure of its legs agrees in every respect except in its hind tibiæ being transversely bicarinate and the basal joint of its hind tarsi more cylindrical; *inter alia* it differs from *Pseudoryctes* by its absolutely vertical clypeus produced upwards into a well developed pointed horn and by the absence of a horn on the front margin of its prothorax. The peculiar position of the clypeus is reproduced in *Palmerstonia*, but without the horn (the male of *Palmerstonia*, however, may have a horn); but in

that genus the palpi are of very extraordinary structure and the basal joint of the hinder tarsi is very widely triangular. The general appearance of the insect on which I found this genus is much like that of *Novapus*, with which genus, however, it does not appear to be closely connected, differing from it *inter alia multa* by its very much shorter and thicker hind tibiæ.

XYNEDRIA INTERIORIS, sp.nov.

♂. Minus latus; sat nitidus; subtus sat dense rufo-hirsutus; rufo-piceus; capite cornu brevi (quam antennarum clava breviori) erecto ad apicem simplici instructo; prothorace quam longiori vix plus quam dimidio latiori, postice quam antice fere duplo latiori, sparsim subtiliter punctulato, a basi ad apicem excavato, parte excavata sparsim leviter squamoso-punctulata pone medium angustata, lateribus fortiter rotundatis; scutello externe lævi, antice et in medio confertim punctulato; elytris inæqualiter geminatim punctulato-striatis et hic illic confuse punctulatis, puncturis in striis et alibi sat æqualibus; pygidio fortiter convexo, leviter nec crebre squamoso-punctulato. [Long. 7, lat. 4$\frac{2}{5}$ lines.

♀ latet.

S. Australia; McDonnell Ranges; presented to me by C. French, Esq.

MALACODERMIDÆ.

HELODES ANGULATUS, sp.nov.

Elongato-ovalis; modice convexus; pubescens; palpis antennarum basi prothoracis lateribus pedibusque rufis; capite subcrebre, prothorace sparsim, sat fortiter punctulatis; hoc quam longiori plus quam duplo latiori, æqualiter convexo, angulis posticis rectis; elytris fortiter sat crebre (postice magis leviter) punctulatis haud costatis, stria suturali subfortiter impressa; antennarum articulis 2° 3°que (hoc quam ille multo minori) conjunctis quam 4^{us} parum brevioribus. [Long. 1$\frac{3}{5}$, lat. $\frac{9}{10}$ line.

Characterised by its evenly convex prothorax (not more gibbous in the middle than elsewhere), with well defined rather sharp hind angles, which are slightly directed backward, and the strong sparse puncturation of its upper surface (especially the elytra), which on the prothorax is very much and on the elytra quite evidently stronger and less close than in *H. cinctus*, Blackb.,—probably the nearest ally of this species.

N. S. Wales; Blue Mountains.

SILIS AUSTRALIS, Blackb.

Having had occasion recently to look at this insect, I was much startled to find that I committed an unpardonable blunder in describing it. It has nothing to do with *Silis* but is an *Œdemerid.* How I could have overlooked its heteromerous tarsi I am unable to conjecture; I can only adopt an expression used by Mr. Pascoe under similar circumstances and say that it must have been in "a moment of aberration." The insect certainly has an extremely *Silis*-like facies. It does not appear to have been described in the *Œdemeridæ*, and seems to be congeneric with some at least of the species that are referred to the genus *Ananca*, but unfortunately there is a species among them bearing the same name *(australis)*, so that it will be necessary to give a new name to the subject of this note. I propose the name *Boisduvali* for it. *A. australis*, Boisd., appears to be not unlike it (judging from the brief description of seven words), but to differ in having its legs entirely of a fulvous colour. *Ananca ruficollis*, Macl., also resembles it, but differs *inter alia* by the considerably less fine puncturation of its elytra, by its testaceous meso- and meta-sterna, and by its femora being of a bright testaceous colour, with only the extreme apices infuscate.

ŒDEMERIDÆ.

ANANCA BOISDUVALI, sp.nov.

Vide note on *Silis australis (supra).*

CURCULIONIDÆ.

PELORORHINUS CRASSUS, Blackb.

In describing this species (P.L.S.N.S.W. 1892, p. 135) I accidentally omitted to state that it is found in Western Australia.

AOPLOCNEMIS LOWERI, sp.nov.

Rufo-piceus, rostro obscuriori; squamis fuscis et nonnullis albis vestitus, his in prothoracis lateribus vittatim et in elytrorum lateribus maculatim condensatis; rostro sat crebre subrugulose nec crasse punctulato; antennarum funiculi articulis basalibus 2 elongatis; prothorace granulato, vix transverso; elytris puncturis sat crassis subquadratis seriatim impressis, interstitiis vix convexis, interstitio 3° ad partis declivis basin tuberculo magno conico armato; corpore subtus albo-squamoso. [Long. (rostr. incl.) 5, (vix) lat. 1½ lines.

Readily distinguishable from its congeners by the tubercles placed one on each side of the suture at the summit of the posterior declivity. In the typical example (which seems a little abraded) the white scales form three vittæ on the prothorax of which the middle one is very obscure and some ill-defined spots on the sides of the elytra.

Victoria; presented to me by Mr. Lower.

CYDMÆA.

Mr. Pascoe's *Erirhinid* genera present extreme difficulty owing to his not having followed a uniform system in characterising them; for example, he generally treats (I think quite rightly) the granulation of the eyes as an important character, but in some few of his descriptions he does not mention the granulation of the eyes at all, and so on with almost every other character. The genus *Cydmæa* I feel confident that I have correctly identified, as several of the species (*e.g.*, *C. luctuosa*, Pasc.) have a strongly marked pattern on the elytra which renders them unmistakable by their *specific* characters. The following seem to be the important characters of this genus: form broad and robust (like that of *Gerynassa*, *Dicomada*, &c.); rostrum moderately long and robust, very distinctly distinguished from the general contour of the head, compressed towards the apex when viewed from the side; eyes finely granulated; antennæ inserted in front of the middle of the rostrum, their funicle 7-jointed, their scrobes running obliquely towards the lower extremity of the eye; ocular lobes feebly defined; base of prothorax not bisinuate; prosternum elongate in front of its coxæ, its front margin moderately emarginate; mesosternum wide between the intermediate coxæ; 2nd ventral segment at least as long as the 3rd and 4th together; femora unarmed; anterior tibiæ not denticulate within, their inner apex mucronate; tarsi short and broad, their claw joint projecting moderately beyond the 3rd.

Cydmæa seems to be very close to *Dicomada;* Mr. Pascoe mentions no other difference than that the rostrum of the latter is dilated at the apex and not compressed. The following species present all the characters of *Cydmæa* as described, but it should be noted that Mr. Pascoe *figures* it (Ann. Nat. Hist. 1875, t. 1, fig. 15) as devoid of ocular lobes.

CYDMÆA MAJOR, sp.nov.

Late ovalis; squamis fusco-nigris cinereis fulvisque intermixtis vestita, pedibus antennisque plus minusve rufescentibus; rostro prothorace sublongiori; funiculi articulo 1° quam 2^{us} paulo longiori; prothorace leviter transverso; elytris punctulato-striatis, interstitiis vix convexis.

[Long. $2\frac{1}{2}$-3, lat. $1\frac{1}{5}$-$1\frac{2}{5}$ lines.

At once distinguishable from the previously described species by its considerably greater size. The variously coloured scales are very confusedly mixed together; on the elytra, however, the darker scales predominate on the front half and the lighter on the hind half; on the underside the fulvous scales predominate and have a slightly coppery gloss; the quantity of fulvous scales as compared with the cinereous seems to vary a good deal; abraded specimens are of an almost uniform blackish colour. The tarsi are shorter and wider than in the other *Cydmææ* known to me.

N. S. Wales ; Blue Mountains.

CYDMÆA DIVERSA, Blackb.

An example taken in the Blue Mountains seems to be indistinguishable from the Western Australian type of this species. Although not quite contiguous, its front coxæ are not so markedly separated, however, as in that specimen, seeming to justify my opinion when I described *C. diversa* that that peculiarity is not of extreme importance.

CYDMÆA CRASSIROSTRIS, sp.nov.

Late ovalis; squamis fusco-nigris cinereis fulvo-cupreisque intermixtis vestita, antennarum scapo ad basin rufescenti ; rostro quam prothorax subbreviori apicem versus fortiter compresso; funiculi articulo 1° quam 2^{us} multo (hoc quam sequentes parum) longiori; prothorace leviter transverso; elytris punctulato-striatis, interstitiis vix convexis.

[Long. $1\frac{2}{5}$, lat. $\frac{3}{5}$ line.

On the head and prothorax the coppery-brown scales prevail, and the ashy-grey scales form a line between the eyes and are condensed about the sides of the prothorax ; on the elytra fuscous-black scales may be regarded as forming the ground colour, fulvous-coppery scales form a broad ill-defined sutural stripe behind the scutellum and widen into a large patch occupying the greater part of the apical half of the elytra (the sides being fuscous-black), and in this patch is a narrow inconspicuous fascia of ashy-grey scales. The undersurface is entirely clothed with ashy-grey scales.

The form of the rostrum is very peculiar. It is strongly arched and viewed from above appears nearly parallel-sided (a little narrowed near its base) and moderately narrow, but viewed from the side it appears quite strongly dilated a little before the apex (so that here the distance from the upper to the under surface is greater than the width of the upper surface) and at the apex quite sharply pointed. Thus the rostrum appears from above to be quite slender with a blunt apex, but from the side to be very much wider and more robust, with the apex acuminate.

The second joint of the funicle being scarcely longer than the 3rd joint is also a notable character.

N. S. Wales; Blue Mountains.

LONGICORNES.

ÆGOSOMA.

I refer the following species with some hesitation to this genus of which, unfortunately, I have not a type to compare it with; neither is there one in the S. Australian Museum. From memory of the genus, however, I can say that the species before me has the general appearance of an *Ægosoma*, and the following characters show it to be at least very close to it structurally, viz.: eyes strongly granulated, not embracing the base of the antennæ and not much approximated above (a little more approximated than in *Nothophysis lucanoides*, Serv.); metasternal episterna gradually narrowed from the base hindward, their apex obtuse, scarcely half as wide as their base; prothoracic lateral margins much arched downwards and scarcely continuously existent.

ÆGOSOMA CARPENTARIÆ, sp.nov.

Sat elongatum; sat parallelum; minus nitidum; subtiliter pubescens; fuscum, pedibus abdomineque nonnihil rufescentibus; supra sat rugulose sat crebre nec crasse (elytris retrorsum gradatim magis subtiliter), subtus vix rugulose, punctulatum; antennis (feminæ ?) quam corpus sat brevioribus, articulo basali sat brevi, 2° brevissimo (his subnitidis, sat crasse rugulosis), ceteris pubescentibus sat compressis, 3° quam basales 2 conjuncti paullo longiori, articulis 4-11 singulis quam 3° paullo brevioribus inter se sat æqualibus, articulo apicali indistincte appendiculato; prothorace sat

fortiter transverso, antice modice angustato, supra leviter inæquali, lateribus pone medium dente parvo obtuso armatis, angulis posticis subdentiformibus; elytris apice conjunctim rotundatis, sat parallelis, lineis elevatis 4 vel 5 instructis (ex his externis 2 antice abbreviatis). [Long. 9½, lat. 3½ lines.

The elytra are a little more than half again as wide as the widest part (*i.e.*, the base) of the prothorax and are about four and a half times as long as that segment.

N. Queensland; Cape York; in the collection of C. French, Esq.

PHACODES OCCIDENTALIS, sp.nov.

Sat brevis; sat latus; sat robustus; piceo-ferrugineus, pube albida sat dense submaculatim vestitus; prothorace modice transverso, sat crebre sat fortiter ruguloso, spatiis elevatis nitidis nullis, lateribus in medio fere rectis hinc ad basin coarctatis ad apicem (vix arcuatim) convergentibus, laterum parte mediana recta postice extrorsum prominenti; elytris ad apicem medium spiniformibus, antice crebre postice sparsim granulosis; antennis (feminæ) quam corpus brevioribus, articulo 3° quam 1^{us} vix quam 4^{us} haud multo longiori.
[Long. 10, lat. 3½ lines.

The sides of the prothorax are almost straight and parallel in their middle part; this straight portion is protuberant (as though bearing an obtuse tubercle) at its basal end; whence the lateral margins become strongly convergent hindward and then become parallel again close to the base. The absence of nitid spaces on the prothorax, the shortness of the 3rd joint of the antennæ, and the comparatively large size of the insect suffice in combination to distinguish this species from its previously described congeners.

W. Australia; Ashburton district; in the collection of C. French, Esq.

PHORACANTHA ELEGANS, sp.nov.

Ferruginea, elytris flavo-testaceis, fusco-notatis; corpore toto (elytris exceptis) antennis pedibusque pube cinerea sat dense

vestitis; antennis (feminæ?) quam corpus parum longioribus, articulis 1° 3° 4°que longitudine inter se fere æqualibus, articulis 3-5 sat fortiter spinosis; prothorace 5-tuberculato utrinque spina laterali armato; elytris in partibus duabus anterioribus crassissime postice sat fortiter nec crasse punctulatis ad apicem singulatim fortiter 2-spinosis.

[Long. 10, lat. 2⅘ lines.

The pubescence is dense over the whole body except the elytra, the sculpture of the head and prothorax being almost buried beneath it; on the elytra it is thinly dispersed and inconspicuous. The elytra are yellowish-testaceous, a little clouded here and there with brownish-testaceous, the apical one-fourth part being slightly darker. The fuscous markings on the elytra consist of a narrow very strongly zigzagged line a little in front of the middle, much like that in a similar position on the elytra of *Coptocercus rubripes*, Boisd., a spot on the lateral margin placed a little behind the base, and a transverse mark about half-way between the middle and the apex resembling a broad blotchy zigzag, which becomes narrow close to the lateral margins, where it is turned hindward and runs back nearly to the apex. The general build of the insect is very similar to that of *P. fallax*, Pasc.

I do not think this species can be identical with any of the very briefly described *Phoracanthæ* of Hope; of these *acanthocerus* seems to differ *inter alia* by its black undersurface, and *trimaculatus* to have very differently marked elytra; the others seem to be not much like the present insect.

W. Australia; taken by E. Meyrick, Esq.

PHORACANTHA POSTICALIS, sp.nov.

Subtus rufo-picea; supra nigra, elytris fasciis binis indeterminatis testaceis (altera antemediana altera vix postmediana) ornatis, antennis pedibusque rufis; parum pubescens; antennis (maris multo feminæ paullo) quam corpus longioribus, articulo 3° supra longitudinaliter vix sulcato, articulis 3-7 sat fortiter spinosis; prothorace sat fortiter sat crebre ruguloso, spatio mediano nitido lanceolato alteroque utrinque rotundato subapicali ornato, utrinque spina laterali armato; elytris a basi paullo ultra medium crasse hinc ad apicem sat subtiliter punctulatis, ad apicem singulatim sat fortiter 2-spinosis, parte posteriori nitida. [Long. 6-8, lat. 1½-2 lines.

Not unlike *P. fallax*, Pasc., in general appearance, but a little less robust and with more slender legs and antennæ, the 3rd and 4th joints of the latter being all but devoid of a longitudinal sulcus. The sculpture of the prothorax and elytra and the markings of the latter are as in *P. fallax*, except in the absence of the apical spot on the elytra, which are entirely black from immediately behind the middle to the apex. Also resembles *Coptocercus unifasciatus*, Hope, which, however, has no lateral spines on its prothorax.

S. Australia; widely distributed, but apparently not common.

TRYPHOCHARIA SOLIDA, sp nov.

Lata; subdepressa; ferruginea, prothorace elytrisque rufo-aurantiacis, his abdomineque nigro-notatis; parum pubescens; antennis (feminæ) quam corpus multo brevioribus, articulo 4° quam 1^{us} haud longiori quam 3^{us} sat breviori, articulis 3-7 spinis binis validis armatis; prothorace crassissime ruguloso 5-tuberculato, utrinque spina laterali armato; elytris crassissime valde rugulose punctulatis (puncturis ad apicem summum manifeste minus crassis minus rugulosis), ad apicem spinis binis robustis elongatis armatis; metasterno sat crebre minus fortiter, abdomine sparsissime sat fortiter punctulatis.

[Long. 13, lat. 4⅕ lines.

Not much like any of the previously described species of *Tryphocharia*. Compared with *T. hamata*, Newm., this is a very much wider and more depressed species, with its prothorax much more coarsely rugulose and having lateral spines not bent at the apex, its elytra much more coarsely rugulose (the rugulosity being much less enfeebled posteriorly) and differently marked, its antennæ (in the female) much shorter and with the 3rd joint considerably longer in proportion to the 4th, and its legs evidently shorter and stouter. The depressed portions of the prothorax are black,—in strong contrast to the orange-red elevated parts. On the elytra the black markings are almost as extensive as the orange-red colour ; they are very vaguely dispersed, but nevertheless can be regarded as forming two extremely ill-defined fasciæ (one basal, the other median) and an evidently better defined common spot near the apex.

An example (from N.W. Australia) in my collection appears to me to be the male of this species; it scarcely differs from the specimen described above, except in the way that *T. hamata*, Newm., differs from its female, *i.e.*, by the more cylindrical form (this difference is a little more marked than in *hamata)*, the less strongly transverse prothorax, and the longer antennæ (in this example they scarcely reach beyond the apex of the elytra); it also shows a greater predominance of the orange-red colouring on the elytra, but the black markings although reduced in quantity are evidently what those of Mr. French's example would be if some of them were effaced; this difference is not likely to be even of sexual value.

N. Queensland; Cape York; in the collection of C. French, Esq.

PAPHORA ROBUSTIOR, sp.nov.

Sat robusta; fusca; pube grisea sparsim vestita; prothorace quam latiori sublongiori, medio cicatricoso; elytris oblongis ad apicem rotundato-truncatis; pedibus sat validis; antennis (feminæ) quam corpus multo brevioribus.

[Long. $5\frac{3}{4}$, lat. $1\frac{3}{5}$ lines.

Very like *P. modesta*, Pasc., but larger and of more robust form and darker colour, with legs and antennæ evidently stouter and the apex of each elytron broadly rounded, almost subtruncate (the elytra of *P. modesta* are much more narrowed at the apex). I have seen numerous specimens of *C. modesta* of both sexes, so that I am confident the above-mentioned differences indicate a good species.

W. Australia; Nullabor Plains; in the collection of C. French, Esq.

NEOBETHELIUM (gen.nov.)

Palpi sat breves, maxillaribus quam labiales parum longioribus; caput breve antice sat verticale; antennæ (maris) quam corpus duplo longiores (articulo basali fortiter arcuato 3° longitudine sat æquali, 4° quam 3^{us} paullo longiori, 5°-11° quam ceteri multo longioribus ex ordine magis elongatis, 5° 6°que conjuncti quam 1^{us}-4^{us} conjuncti sublongioribus); oculi grosse granulati supra approximati; prothorax (maris) cylindricus inermis quam caput multo angustiori; elytra postice rotundata; pedes modici, femoribus fortiter clavatis; coxæ anticæ modice exsertæ subcontiguæ.

The insect for which I propose this new generic name must, I think, be referred to the *Callidiopsides*. It is very distinct by the following characters in combination: eyes coarsely granulated, basal 4 joints of the antennæ together shorter than the 5th and 6th together, head (at any rate in the male) much wider than the prothorax, subvertical in front (as in *Bethelium*). In some respects, especially in the length of the antennæ and the proportion of their joints *inter se* and the general facies of the insect, this species resembles *Mecynopus*, from which it may be at once distinguished by its much more coarsely granulated eyes and shorter hind femora (the latter when set back not reaching beyond the base of the apical ventral segment).

NEOBETHELIUM MEGACEPHALUM, sp.nov.

Setis erectis subtilibus sparsim vestitum; sat nitidum; nigropiceum, palpis tibiarum basi tarsorum apice antennarum articulis ad basin et in elytris maculis elongatis indeterminatis nonnullis testaceis; prothorace quam latiori longiori, cylindrico, sat æquali, subfortiter punctulato et transversim plus minusve rugato; elytris sat fortiter punctulatis et costis nonnullis obscuris instructis, postice rotundatis.

[Long. 4, lat. $\frac{4}{5}$ line.

The basal half or thereabouts of each of joints 4-11 of the antennæ is testaceous ; the apical half, however (which is black on the 4th joint), becomes paler on each joint successively, so that on the apical joints there is very little difference in the colour of the basal and apical parts. The elytra are not of uniform colour, for, independently of the testaceous markings, the nigro-piceous colour passes here and there (especially towards the sides) into reddish.

N.S.W. ; in my collection ; also sent from Queensland by Mr. French.

PORITHEA.

I refer the following species to this genus with some hesitation, as I have not, to my knowledge, seen an example of the unique previously described species. Indeed the general appearance of this insect is not suggestive of its being closely allied to any other known to me. Judged strictly by its structure, it would have to be placed among the *Phoracanthides*, as it has coarsely granulated eyes, intermediate coxal cavities closed externally, head not produced in front, and joints 3-5 of the antennæ spined. But it is so totally unlike other *Phoracanthides* that it seems impossible to place it among them. Of the preceding characters the antennal spines alone distinguish the *Phoracanthides* from the *Callidiopsides*, and both Mr. Pascoe and myself have already described as aberrant *Callidiopsides* species with a single antennal spine. The general build and colouring of this insect are fairly suggestive of *Callidiopsis*, and so I think it had better be regarded as an extremely aberrant member of that group.

Regarding this species then as a *Callidiopsid*, there seems no reason to place it elsewhere than in *Porithea*, for the presence of antennal spines in that group does not appear to be generic, and the following characters are all suggestive of *Porithea* : femora strongly pedunculate at base strongly clavate at apex, front of head vertical, the maxillary palpi fully twice as long as the labial and having their apical joint elongate-securiform. The only characters at all inconsistent with *Porithea* as described by M.

Lacordaire are the following: the antennæ are considerably more than "hardly" villose beneath, and their 3rd joint is slightly longer than their 5th. On the whole it appears to me better to call this insect "*Porithea ?*" than to found a new genus for it.

PORITHEA PLAGIATA, sp.nov.

Modice elongata; sat opaca; fusca, antennis (nonnullorum articulorum apice excepto) femorum basi tibiis (apice excepto) tarsis (parte mediana excepta) elytrorumque maculis singulis lateralibus antemedianis magnis et fascia communi undulata anteapicali sat lata testaceis, capite metasterno et abdominis parte mediana rufescentibus; antennis quam corpus vix longioribus, articulo 3° quam 4^{us} paullo longiori, hoc quam 5^{us} vix longiori; capite prothoraceque subtilissime rugulosis (vel potius coriaceis); hoc quam latiori vix longiori, lineis 3 elevatis brevibus et tuberculis parvis 2 ornato, lateribus postice et antice sat parallelis in parte mediana sat rotundatis; elytris sat crebre sat subtiliter ruguloso-punctulatis, ad apicem rotundato-truncatis. [Long. 5, lat. $1\frac{1}{5}$ lines.

The inequalities on the prothorax consist of a short longitudinal elevated line on the middle of the disc and another (similar, but slightly more elevated) placed obliquely on either side of it slightly in front of the middle, and two small discoidal tubercles near the base.

N. S. Wales; Tweed River district.

APOSITES GRACILIS, sp.nov.

Fuscus, pube tenui grisea vestitus; prothorace quam latiori sublongiori, transversim rugato, antice sat angustato, lateribus a margine antico retrorsum divergentibus (in medio subangulatis vel potius subtuberculatim dilatatis, hinc retrorsum fere parallelis nihilominus ad basin summam divergentibus); elytris externe sat emarginatis, ad apicem angustatis, costis 3 discoidalibus sat obsoletis instructis; antennis (maris) quam corpus sat manifeste (articulorum apicalium 2 longitudine) longioribus, his minus fortiter compressis.

[Long. 7, lat. $1\frac{1}{2}$ lines.

W. Australia; Gnarlbine; in the collection of C. French, Esq.

SCOLECOBROTUS VALIDUS, sp.nov.

Ferrugineus, totus pube sat densa flava vestitus; prothorace quam latiori vix longiori; elytris antice minus crasse punctulatis; antennis (maris ?) quam corpus paullo longioribus, articulis 5-10 sat compressis haud serratis intus ad apicem lobatis; cetera fere ut *S. Westwoodi*, Hope.

[Long. 11, lat. $4\frac{2}{5}$ lines.

Entirely of a ferruginous colour, the legs and abdomen somewhat paler, the upper and under surfaces very evenly and closely clothed with yellowish pubescence, which almost conceals the sculpture. The antennæ are almost exactly like those of a male *S. Westwoodi*, but without any of the serration of that species except the apical lobe-like process. Compared with *S. Westwoodi*, the build of the whole insect is a little more robust, the head a little less produced in front, the prothorax considerably less elongate and (as far as can be seen under the pubescence) less uneven, and the anterior portion of the elytra evidently less strongly rugulose. I have no doubt the specimen described is a male, but if it were a female, its antennæ a little longer than the body would at once distinguish it from the same sex of *S. Westwoodi*. The twelfth joint of the antennæ is shorter than in the male, and about as long as in the female, of *S. Westwoodi*.

N.W. Australia; in the collection of C. French, Esq.

STRONGYLURUS MINOR, sp.nov.

Rufus, capite prothoraceque paullo obscurioribus; disperse albo-pilosus; prothorace quam latiori paullo longiori, sat crebre vix crasse granuloso-punctulato, flavo 4-maculato; elytris modice elongatis ad apicem rotundatis, antice sat fortiter postice obsolete punctulatis. [Long. 5, lat. $1\frac{3}{10}$ lines.

Resembles *S. ceresioides*, Pasc., in its uniformly coloured elytra rounded at their apex, but differs from it by its prothorax slightly (to a casual glance considerably) longer than wide and much less coarsely punctured, and by the considerably less coarse puncturation of its elytra.

N. Queensland; in the collection of C. French, Esq.

DISTICHOCERA FRENCHI, sp.nov.

♂. Atra; capite prothorace sternis et elytrorum parte basali (fere dimidio) dense rubro-aurantiaco-pubescentibus; elytrorum parte apicali dense nigro-pubescenti, apice summo truncato bi-apiculato. [Long. 9, lat. 3 lines.

Black, the part of the body on both the upper and under surface in front of the hind margin of the metasternum densely clothed with bright reddish-orange silky pubescence; the rest of the elytra densely clothed with black pubescence; part of the derm (especially on the elytra) underlying the orange pubescence concolorous with that pubescence. Head produced anteriorly, deeply grooved between the antennæ, which are as long as the body and formed as in the males of others of the genus, but with the ramulæ of the joints extremely broad (very much broader, *e.g.*, than in *D. par*, Newm.) and the apical joint almost cylindric. Prothorax rather wider than long, with the hind angles prominent laterally and another protuberance a little in front of them on the sides. Elytra much narrowed hindwards, very finely and closely punctulate, each with several scarcely defined elevated lines.

N. Queensland; in the collection of C. French, Esq.

ATHEMISTUS CRISTATUS, sp.nov.

Niger, opacus; setis brevibus pallidis sparsim vestitus; capite prothoraceque fere impunctatis; hoc tuberculis 5 discoidalibus ornatis, lateribus pone medium dente sat valido armatis; elytris ad apicem oblique truncatis, vix punctulatis, seriatim tuberculis sat parvis sat crebris instructis, his ad humeros ut crista elevata condensatis; scutello fortiter transverso. [Long. 6, lat. $2\frac{2}{5}$ lines.

The tubercles on the prothorax consist of two near the base (which are opaque), and three nitid (of which the middle one is very small), so placed as to form with the lateral teeth a continuous row.

This species must be near *A. Howitti*, Pasc., but seems certainly distinct, that insect being described as of a fulvous-brown colour, with pale legs and antennæ; its scutellum is said to be narrowly triangular, and there is no mention of anything like the conspicuous crest-like ridge into which the 4th (from the suture) row of tubercles is elevated at the base of the elytra (a character that Mr. Pascoe could hardly have passed over unnoticed). From *A. rugosulus*, Guér., the only other large species of black colour with the prothorax almost impunctulate, the present insect differs by the truncate apex of its elytra.

N. S. Wales; Blue Mountains.

ATHEMISTUS MONTICOLA, sp.nov.

Piceus; sat opacus; pube subtilissima sericea dilutiori dense vestitus; capite sparsissime leviter vix subtiliter punctulato, linea subtilissima mediana (antice subelevata postice subimpressa) instructo; prothorace ut caput punctulato, supra vix inæquali haud determinate tuberculato, lateribus tuberculo parvo obtuso armatis; elytris ad apicem oblique subtruncatis, confertim subseriatim granuloso-punctulato-rugulosis; scutello sat fortiter transverso.

[Long 5-6, lat. 2-2$\frac{2}{5}$ lines.

Perfectly fresh specimens are sparsely sprinkled with extremely fine short erect hairs and closely covered with a very fine silky pubescence, the conspicuousness of which depends on the position in which the light falls on it. This pubescence is more fulvous on the prothorax and more whitish on the elytra, and it leaves a large denuded spot on either side of the base of the prothorax, and a smaller one on either side at the front margin. The sculpture of the elytra is extremely difficult to describe; the surface seems to be somewhat irregularly punctulate-striate, the punctures rather large and coarse, but this sculpture is rendered indistinct both by the pubescence and by a multitude of small obscure granules scattered indiscriminately over the striæ and interstices. This species seems to be near *A. pubescens*, Pasc., but the prothorax of that insect is described as "coarsely punctured," whereas the prothorax of this species appears quite impunctulate except under a strong lens; it is infinitely less strongly punctured than the prothorax of *A. bituberculatus*, Pasc., which its author calls merely "sparsely punctured."

Victoria; on the higher Alps.

ATHEMISTUS TORRIDUS, sp.nov.

Ferrugineus; opacus; pube subtillissima sericea dilutiori (hic illic squamis piliformibus cinereis submaculatim variegata) vestitus; capite leviter, prothorace sat profunde, crasse sat sparsim punctulatis; hoc tuberculis 3 discoidalibus (transversim positis) ornatis, lateribus pone medium dente sat valido instructis; elytris ad apicem rotundatis, seriatim verrucosis, postice 2-tuberculatis. [Long. 3, lat. $1\frac{1}{10}$ lines.

The smallest species of the genus yet described. The two posterior tubercles of the elytra (one on each elytron, about half way down the posterior declivity) distinguish it from all its congeners except *bituberculatus*, Pasc., and *æthiops*, Pasc. From the latter of these it is distinguished by its colour and by the row of three ill-defined tubercles on the prothorax forming a continuous line with the lateral tubercles, and from the former by its much smaller size and the more strongly defined (almost spiniform) lateral tubercles of its prothorax.

Queensland; Cape York; in the collection of C. French, Esq.

SYMPHILETES DENTIPES, sp.nov.

♂. Nitidus; minus pubescens; piceus, pedibus rufescentibus; capite pilis elongatis albidis sat sparsim vestito; tibiis anticis subtus, intermediis extus, posticis intus, dense pallide hirsutis, segmentis ventralibus postice ciliis pallidis perlongis ornatis; antennis supra pube subtili grisea dense vestitis, subtus dense ferrugineo-ciliatis; capite crasse rugulose punctulato, linea mediana longitudinali elevata obscura instructo; prothorace quam longiori vix latiori, sat crebre sat crasse confuse rugato et sparsim punctulato, disco tuberculis 2 parvis munito, lateribus antice tuberculo parvo armatis; elytris sat grosse punctulatis, apice sinuato-truncatis, spina suturali apicali armatis, basin versus tuberculatis, tuberculis majoribus in utroque elytro juxta basin seriatim positis, ex his tuberculo mediano permagno; antennis quam corpus sat longioribus, ad apicem summum hamatis; coxis anticis spina magna recurva armatis, femoribus anticis dente magno obtuso subapicali armatis, tibiis anticis basi valde arcuatis, subtus in medio dente magno armatis. [Long. 12, lat. 4 lines.

It is possible that the type of this species is abraded, but I do not hesitate to describe it as its characters of sculpture and of sex are extremely remarkable. The dense pilosity on the tibiæ and the toothed front femora and tibiæ of the male are not found, I think, in any other described *Symphiletes*, except the toothed front tibiæ which are attributed to *S. neglectus*—a very different species. The tubercles on the front part of the elytra consist of three rows on each, in which those of the sutural and external ones are small, while those of the middle row are larger, especially the middle one of that row, which is very large (being about the same size as the tubercle at the base of the elytra in *Demonassa dichotoma*, Newm.). The elytra are punctured very much as in *D. dichotoma* except that their puncturation is scarcely so coarse in front and is less enfeebled behind.

This species bears a good deal of general resemblance to *S. fumatus*, Pasc., but differs from it by its remarkable sexual characters, by its more elongate prothorax, the very much greater size of one of the elytral tubercles, the longer 3rd joint of its antennæ (in the male), &c., &c. Mr. Pascoe says that the prothorax of *S. fumatus* is longer than broad, a statement clearly not founded on measurement, which shows the prothorax distinctly wider than long, though to a casual glance it appears elongate.

Queensland; in my collection.

IPHIASTUS DISPAR, sp.nov.

Piceo-ferrugineus; pube versicolori (sc. grisea albida aurantiacaque) vestitus; pube aurantiaca in capite prothoraceque lineatim in elytris maculatim disposita; elytris apice truncatis, truncatura externe angulato-prominenti, parte basali granulata. [Long. 12, lat. 4½ lines.

This species must certainly, I think, be referred to *Iphiastus*, although its markings and vestiture are not much like those of the typical species (*I. heros*, Pasc.). Mr. Pascoe originally described *I. heros* as a *Symphiletes*, but afterwards founded *Iphiastus* for it on the ground chiefly of its antennal tubers being more prominent and approximate than those of *Symphiletes;* he mentions several other characters, but says that they are all merely those of *Symphiletes* exaggerated. The prominence of the antennal tubers, however, appears to me a really good generic character, and I notice also a character Mr. Pascoe did not mention in the much greater length of the legs. These characters are well defined in *I. dispar.*

In the present species (as in so many species of *Rhytiphora* and *Symphiletes*) the whole surface, including the legs and antennæ, is closely covered with a fine pubescence (it is of a slate colour tending to whitish on the metasternum) which may be regarded as forming the ground colour of the insect, while pubescence of another colour (orange-red) is superadded and forms the markings. The slate-coloured pubescence is pitted on the elytra and undersurface with small denuded spaces which give the appearance of a multitude of little dark spots. The orange-red pubescence forms the following markings: on the head a line on either side of the impressed median line, a ring round each eye, a line behind each eye, and a patch at the base of each mandible; on the prothorax six transverse lines, the 2nd and 3rd (counted from the base) being irregular; on the elytra a number of small spots very evenly distributed over the whole surface (very much as the ferruginous spots are distributed in *Rhytiphora Waterhousei*, Pasc., and

Symphiletes pubiventris, Pasc.); on the undersurface a number of spots (like those of the elytra) on the metasternum, some lines on the mesosternum, and the hind margin of each ventral segment. The orange-red pubescence is also vaguely distributed over the middle part of the pro- and meso-sterna and the legs. The prothorax has no lateral tubercles, but bears four or five transverse impressions or folds, the presence of which causes the lateral margins, viewed from above, to appear uneven. There is a fine elevated transverse line across the middle of the prothorax, which being *unevenly* elevated causes a slight appearance of a transverse row of scarcely defined tubercles. The part of the prothorax in front of the front fold is slightly narrower than the rest, but not so markedly as in *I. heros*. The antennæ are a little longer than the body and of a pitchy colour, much clothed (probably *entirely* in a perfectly fresh specimen) with slate-coloured pubescence, and thickly ciliated beneath. In the typical specimen the 2nd ventral segment bears a large patch of brown pilosity on either side and there is a strong (but very short) spine on each front coxa.

N. Queensland; Cape York; in Mr. French's collection.

PHYTOPHAGA.

RHOMBOSTERNUS OBSCURUS, sp.nov.

♂. Sat nitidus; rufo-brunneus, capite postice antennarum basi apiceque prothoracis disco tibiarum apice et (nonnullorum exemplorum) tarsorum articulo 3° nigris; oculis inter se sat approximatis; capite prothoraceque crebre fortiter rugulosis; hoc quam longiori dimidio latiori, angulis anticis minute dentiformibus; scutello lævi basin versus nigricanti; elytris rude punctulatis, puncturis pone medium seriatim dispositis, interstitiis costiformibus ante medium confuse subreticulatim pone medium longitudinaliter dispositis; segmento ventrali apicali ante apicem transversim impresso, ad apicem rotundato; antennis quam corpus multo longioribus.

[Long. 2½, lat. 1¼ lines.

♀. Major ; robustior ; tota rufo-brunnea, antennarum apice scutelloque nigricantibus exceptis ; oculis inter se minus approximatis ; prothorace paullo magis transverso, angulis anticis vix dentiformibus; segmento ventrali apicali profunde subrotundatim excavato. [Long. 3, lat. 1$\frac{4}{5}$ lines.

N. S. Wales ; Blue Mountains.

RHOMBOSTERNUS MONTICOLA, sp.nov.

♂. Sat nitidus ; flavus, elytris flavo-testaceis, capitis macula pone oculos (hac in medio antrorsum anguste producta) prothoracis macula discoidali trifida et utrinque macula basali triangulari (nonnullorum exemplorum maculis basalibus cum macula discoïdali anguste connexis) sutura (hac angustissime) et tarsorum apice nigris, antennarum apice summo et elytrorum puncturis infuscatis; oculis inter se sat approximatis; capite subtilius rugulose crebre, prothorace rude inæqualiter, punctulatis ; hoc quam longiori fere duplo latiori, angulis anticis minute dentiformibus ; scutello lævi ad basin anguste nigro ; elytris sat æqualiter (apice lævi excepto) punctulato-striatis, antice transversim modice rugatis, interstitiis parum convexis ; segmento ventrali apicali foveis 3 leviter impressis transversim instructo ; antennis quam corpus multo longioribus. [Long. 2$\frac{2}{5}$, lat. 1$\frac{1}{5}$ lines.

♀. Major ; robustior ; supra rufa latera et apicem versus flavescens, ut mas nigro-notata, antennis totis (vel fere totis) rufo-testaceis ; oculis inter se minus approximatis ; prothorace paullo magis transverso, angulis anticis vix dentiformibus ; segmento ventrali apicali profunde subrotundatim excavato.

[Long. 2$\frac{4}{5}$, lat. 1$\frac{3}{5}$ lines.

Victoria ; Alpine district.

RHOMBOSTERNUS PALLIDUS, sp.nov.

♂. Sat nitidus ; testaceus, antennis apicem versus elytrorum puncturis et tarsorum articulo 3° infuscatis, elytrorum prothoracisque basi anguste nigra; oculis inter se sat approximatis; capite sat fortiter minus crebre, prothorace crasse sparsim, punctulatis; hoc quam longiori duplo latiori, angulis anticis vix dentiformibus; scutello lævi; elytris minus fortiter subseriatim punctulatis, antice transversim rugatis, interstitiis vix manifeste convexis; segmento ventrali apicali transversim leviter impresso; antennis quam corpus multo longioribus.

[Long. $2\frac{2}{5}$, lat. $1\frac{1}{5}$ lines.

♀. latet.

The infuscation of the seriate punctures on the elytra causes those organs to appear to a casual glance striped with a number of brownish lines. This species is near *R. cicatricosus*, Chp., (a species that I think I have correctly identified), but differs from it, *inter alia*, by the very much less close puncturation of its prothorax.

N. S. Wales; Blue Mountains.

RHOMBOSTERNUS MINOR, sp.nov.

♂. Sat nitidus; ruber, prothorace indeterminate nigro-notato, antennarum tibiarumque apice summo tarsorum articulo tertio et metasterni parte media infuscatis; oculis inter se minus approximatis; capite sat crebre minus fortiter ruguloso; prothorace grosse ruguloso, quam longiori fere duplo latiori, angulis anticis minute acutis vix dentiformibus; scutello ruguloso haud elevato, in medio carina lævi instructo; elytris inæqualibus (sc. regione scutellari subgibbosa), fortiter seriatim punctulatis, interstitiis angustis carinatis; segmento ventrali apicali in medio fovea subrotundata leviter impressa instructo; antennis quam corpus vix longioribus.

[Long. 2, lat. 1 line.

♀. Major; robustior; antennis quam corporis dimidium parum longioribus; prothorace quam longiori duplo latiori; segmento ventrali apicali profunde subrotundatim excavato.

[Long. $2\frac{1}{5}$, lat. $1\frac{1}{5}$ lines.

This species, by its comparatively short antennæ and other characters, seems to be allied to *R. sartor*, Suff., and *sutor*, Suff., which, however, are described as considerably larger insects with black antennæ. The scutellum not being elevated behind above the level of the elytra gives the present species a facies somewhat different from that of its described congeners, but I think this character is due merely to the part of the elytra immediately behind the scutellum being itself somewhat gibbose.

Victoria ; Alpine district.

NOTES ON THE FAMILY *BRACHYSCELIDÆ*, WITH DESCRIPTIONS OF NEW SPECIES.

PART II.

BY WALTER W. FROGGATT, TECHNOLOGICAL MUSEUM, SYDNEY.

(Plate VIII.)

The second part of my Notes on this group contains descriptions of gall-making coccids belonging to the genera *Opisthoscelis* and *Ascelis*, which were formed by H. L. Schrader in his second paper entitled "Further Communications on the Gall-making Coccidæ," published in the Proceedings of the Entomological Society of New South Wales, Vol. i. p. 6 (1862).

These genera he defined as follows: "*Opisthoscelis* where they have only two long posterior legs"; and "*Ascelis* where there are no vestiges of legs."

I have examined a large amount of material and have come to the conclusion that *Opisthoscelis subrotunda*, Schrader, the type of the genus, is a very distinct species; but *O. gracilis*, in my opinion, is only a variety of it.

Not having all my notes on a number of other species of this genus quite ready, I hold them over for Part III., so that in the meantime I can examine several in their later stages of development.

I have had some correspondence on the characteristics of these coccids with Mr. W. H. Maskell, who says that "The Group *Brachyscelidæ* should be confined to those coccids in which the female has the last segment produced into 'a tail,' and that the fact of producing a gall alone does not constitute a Brachyscelid." Acting on the advice of such a well known authority on the *Coccidæ*, I at present confine my observations to the coccids that can be placed in the above genera, considering that the peg-like anal projection of *Opisthoscelis subrotunda*, Schrader, and the more rounded tails of other "spine-gall"-making species, as well as the remarkable tubular appendage of *Ascelis* (though it is doubtful on what portion of the coccid the latter is produced), to be well-defined tails.

In this paper I have redescribed Schrader's species, of which he gave very meagre details; and I have added two new species to the genus *Ascelis*.

OPISTHOSCELIS SUBROTUNDA, Schrader, Trans. Ent. Soc. N.S.W. 1862, Vol. i. p. 7, pl. III. figs. 1-o.

♀. Gall 5 lines in diameter, round, dull green to yellow, growing upon leaves; a small circular basal orifice in the centre of the brown button-like patch on the underside of the leaf; gall chamber small, closely enclosing the coccid, the walls thick, showing a radiating structure when cut across.

♀. Larvæ pale red, with semitransparent legs and antennæ; enclosed in an oval white egg-sac, on emerging from which they are very active; antennæ stout at base, composed of 4 (?) short joints surmounted by a bristle as long as the combined joints; slightly lobed in centre of head; body short, shield-shaped, rather pointed at the apex, with a distinct marginal rim, forming a fine serrate edge extending right round from the head to the tip of abdomen, a little more oval than round, abdominal segments narrow but distinct; legs stout, long, tarsi terminating in two finely hooked claws; anal segment with a long slender filament half the length of the whole insect, produced on either side.

♀. Coccid (1st stage) reddish-yellow, almost oval but slightly constricted towards the tip of the abdomen, closely covered with fine downy hairs forming a fringe round the margin; dorsal eyes small, round, black, and shining; the centre of the ventral surface of the second segment or fold with a pear-shaped orifice, which in live specimens under the microscope shows a regular throbbing movement; on either side of the mouth a short pointed three-jointed leg; the 2nd thoracic segment with a similar pair of legs slightly longer; the 3rd thoracic segment with longer stouter legs, with elongated tibiæ.

♀. Coccid 4 lines long, 3½ broad; reddish-brown, covered with close fine hairs; dorsal surface rounded, broadest at the top, tapering to the anal tip, segmental divisions distinct; ventral surface with the apex forming a rounded protuberance in the centre and a fold-like margin on the outer edges down to the anal appendage, of six broad segments, the 2nd and 3rd thoracic segments without any signs of legs, the 3rd with two long legs, the femora small but stout, the tibiæ medium, of uniform thickness, tarsal joint as long or longer than tibia, of a uniform thickness, rounded at tip, without any sign of tarsal claw; anal appendage a rounded peg-like tail, which fits into and closes the basal orifice of the gall.

♂. Galls unknown to me. Schrader says that they are small conical galls often growing upon the same leaves as the female ones. In only one instance have I found conical galls upon the same leaves; these were very numerous, more rounded at the apex than those described and figured by Schrader, and appeared much more like aborted female galls.

♂. Coccid: Schrader says, "of a red colour, with anal setæ, the body, legs, and antennæ very hirsute; length about two lines."

Hab.—The female galls are very plentiful, generally found on the leaves of young trees either growing singly or in twos or threes upon the leaves. At Sutherland, near Sydney, I found them very plentiful, and full grown in February and March on *Eucalyptus capitellata.*

ASCELIS PRÆMOLLIS, Schrader, Trans. Ent. Soc. N.S.W. Vol. i. p. 7, 1862, pl. III. figs. p-x.

♀. Gall round, from ½ to ¾ of an inch in diameter, green to dull yellow, growing upon the leaves either singly or in groups of two or three, often quite aborting the leaves; basal orifice small, circular, opening on the underside of the leaf; sometimes there is a false chamber, irregular in form (between the outer surface of the leaf and the gall), into which the basal orifice opens. Gall solid, with transverse structure, the inner coating thin and horny, closely fitting round the coccid.

♀. Larva pale yellow, roundish-oval; head rounded in front, with short conical 4-jointed antennæ, eyes small, round, black, close behind the base of the antennæ; legs long, slender, terminating in two hooked claws at the tip of the tarsi.

♀. Coccid 2 lines long, varying much in size; no signs of legs, eyes, or antennæ; body consisting of a shapeless, irregularly round, wrinkled, pale yellow mass; anal appendage stout, cylindrical, dark ferruginous, surrounded at the base by a flat ferruginous ring, apex of anal appendage tubular, with three slender finger-like projections, which always hold a small lump of gummy secretion, which, together with the tips of the caliper-like fingers, fit into and closely fill up the basal orifice.

♂. Larvæ living with the female larvæ in the female galls, in which they come to maturity; I have generally found from twenty to thirty in a mature female gall remaining long after the female larvæ have escaped, pale pink to salmon red, rounded at the head and tapering to a point at the tip of the abdomen; antennæ stout at base, short, 4-jointed, and pointed at apex; abdominal segments broad and distinct, legs stout, long, and terminating with two hooked claws.

♂. Coccid with the head and thorax crimson to reddish-salmon colour; legs and antennæ semitransparent; dorsal eyes black, globular, small, and very close together; antennæ short, composed of nine elongate oval joints slightly stalked at the base, with the last two somewhat tapering, thickly clothed with short stout hairs; front of head square across, constricted at the eyes, which are placed behind the base of the antennæ, swelling out into a rounded lobe behind them, truncate at the junction with the prothorax; the latter narrow; mesothorax broad, with the central lobe large, almost square, horn-coloured, and marked with two crescent-shaped lines in front; metathorax sloping at apex; wings opaline, semiopaque, with broad stout longitudinal and transverse discoidal veins, the whole closely covered with fine short hairs; legs long, slender, and very hairy: abdomen semitransparent, long, slender, lance-shaped; 1st joint longest, slightly constricted at the apex; 2nd and 3rd medium, shorter, cylindrical; 4th half the length of third; 5th and 6th very small and short; 7th lance-shaped, pointed, and moved readily from side to side during life.

Hab.—The galls are plentiful in the neighbourhood of Sydney, growing upon the leaves of *Eucalyptus corymbosa*, and in my experience only upon this species; they vary much in size, as also does the female coccid. Last March I found large numbers at Sutherland, the *Opisthoscelis* growing upon *E. capitellata* close by.

ASCELIS SCHRADERI, n.sp.

♀. Gall an irregular rounded blister ½ inch in diameter, two lines in thickness, forming a cavity or blister in the centre of the leaf; pale yellow to reddish-brown; apical orifice small, cylindrical on the upper side of the leaf, the anal appendage filling up the orifice but not coming to the surface of the leaf.

♀. Larva pale yellow, flat, round, with the abdomen coming to a point at the tip; eyes round, wide apart, with an angular mark behind them and a similar mark below at the junction of the abdomen and thorax; abdominal segments narrow, but sharply defined; antennæ very short; legs rudimentary.

The larvæ at this stage have left the female gall and are half-buried in the young leaves; the leaf tissue apparently grows over them, as perfect galls very little bigger than the coccids are numerous on the leaves.

♀. Coccid pale yellow, 2-3 lines in diameter, an irregular wrinkled the rounded mass without any vestiges of legs, antennæ, or eyes; anal appendage more slender than in *A. præmollis,* surrounded with a similar band or ring at the base, and truncate at the tip, without the finger-like appendages, and apparently solid, not tubular.

♂. Larva pale yellow to bright crimson, the antennæ 4-jointed, short and stout, coming to a point at the tip, situated on either side of a projecting angular forehead in front of the eyes, the latter small and globular, placed behind the base of the antennæ, wide apart; the body swelling out behind the eyes and tapering down to the apex of the abdomen; legs short, slender, covered with short hairs, and terminating in two finely hooked claws; abdominal segment and outer margins of the others rounded and fringed with fine hairs, with fine hairs upon the lower half of the segments.

♂. Coccid differing in no distinctive character from that of the previous species.

This *Ascelis* gall was known to Schrader, who mentions them in his paper previously quoted as "large flat swellings on both sides of the leaves"; but he evidently considered it to be another form of *A. prœmollis.* Though both grow upon *Eucalyptus corymbosa* in the same localities, yet I have never found both growing on the same tree.

ASCELIS ATTENUATA, n.sp.

♀. Galls very small, ½ line in diameter; reddish-brown, flat and swelling out on either side of the leaf, with the apical orifice on the upper side as in the former species.

♀. Coccid a pale yellow wrinkled mass, with a very long and slender cylindrical anal appendage, truncate at the tip, surrounded at the base by a broad dark brown ring or band.

Hab.—Thornleigh, N.S.W.; in January; on the foliage of *Eucalyptus piperita.*

EXPLANATION OF PLATE VIII.

Ascelis prœmollis, Schrader.

Fig. 1. —Female galls.
Fig. 1a.—Male larva.
Fig. 1b.—Female coccid, viewed from above.
Fig. 1c.—Female coccid, viewed from the side.
Fig. 1d.—Male coccid with the eyes round, and only just divided from each other.

Opisthoscelis subrotunda, Schrader.

Fig. 2. —Female galls.
Fig. 2a.—Female coccid in first stage.
Fig. 2b.—Female coccid, full grown (front view).
Fig. 2c.—Female coccid (back view).

Ascelis Schraderi, n.sp.

Fig. 3. —Galls.
Fig. 3a.—Female in first stage when entering the leaf.
Fig. 3b.—Male larva.
Fig. 3c.—Female, viewed from above.

Ascelis attenuata, n.sp.

Fig. 4. —Female galls.
Fig. 4a.—Female coccid, viewed from the side.

ON THE HABIT AND USE OF NARDOO *(MARSILEA DRUMMONDII,* A.BR.), TOGETHER WITH SOME OBSERVATIONS ON THE INFLUENCE OF WATER-PLANTS IN RETARDING EVAPORATION.

BY THOS. L. BANCROFT, M.B., EDIN.

(Communicated by J. H. Maiden, F.L.S., F.C.S.)

I lately had an opportunity to visit the south-western corner of Queensland, journeying there viâ South Australia and returning eastward across Queensland.

Nardoo was first encountered in quantity near Lake Kopperamana on Cooper's Creek. I learnt that the blacks in that district, and indeed all over the watershed of the Cooper, Diamantina, and Georgina Rivers, still made use of it as in the days of Burke and Wills; and also that the plant is a *Marsilea,* as had been originally stated, but doubted by some, who thought it impossible that sufficient involucres (sporocarps) to serve for food could be obtained from a *Marsilea,* the Nardoo of Burke and Wills being regarded by them as the seed of *Sesbania aculeata,* Pers. I found also that Nardoo did not grow in permanent water nor in swamps; it was no more a water-plant than Lignum *(Muhlenbeckia Cunninghamii,* F.v.M.), Blue-bush *(Chenopodium auricomum,* Lindl.), or Coolibar *(Eucalyptus bicolor,* A. Cunn.), with which it was associated; it grew only on country subject to inundation and never on sand hills or on stony plains. It is perennial in habit, with a creeping rhizome, the growing end of which remains alive even through a drought, and throws up fronds and involucres after rain or after having been irrigated by flood water. I could not satisfy myself that it propagated by spores. The leaves close up at night. The plant is an ornamental one and would be a valuable addition to the fernery.

Windorah, on the Cooper, is the nearest place to Brisbane that I saw it growing; roots which I brought from there grew into vigorous plants outside, but the continuous rain in February last proved too much and they died, only one pot, which was under cover, surviving. In a day one could gather about a hundredweight of the dried roots with involucres attached, from which perhaps forty pounds of involucres could be picked; ten pounds might easily enough be obtained daily by one person, which amount would be sufficient for a whole camp of blacks. Nardoo is not a wholesome substance eaten alone, but in addition to other food is a useful adjunct.

At Annandale I had the opportunity to witness the gins preparing Nardoo damper. The involucres, which are very hard, are pounded between two stones; a handful of them is held in the left hand and fed to a stone on the ground, a few grains being allowed to drop from the hand by separating, abducting the little finger, a smart blow being struck with a stone in the right hand, which effectually pulverises every grain at once; it is surprising with what rapidity they can do this work. The flour is mixed with water, kneaded to a dough, and baked in the ashes. The civilised blacks, who were supplied with wheaten flour from the station, were not too proud to make and eat Nardoo damper.

To ascertain if floating water-weeds retard evaporation, as has been stated, the following observations and experiments were made. Fresh-water plants, with a few exceptions, will not grow in water deeper than five feet; some few, such as *Nymphæa* and *Nelumbium*, grow in ten feet, and under very favourable conditions in deeper water, but fifteen feet might be taken as the absolute limit that any fresh-water plant, rooting at the bottom, will grow. These large water-lilies require shallow water wherein to establish themselves and extend gradually to deeper water. It would be hard to start them in deep water from the first.

Reservoirs and permanent waterholes are seldom less than ten feet deep, generally more, so that it would be impracticable, even were it desirable, to grow weeds in them. Of course such plants as *Lemna* and *Azolla* might be grown, provided the surface water was not agitated much by wind.

A number of glass cells each of the capacity of one gallon of water were arranged some with and some without water-weeds; one series was placed outside in the sun, another series in the shade and under cover. Duckweed *(Lemna)*, *Azolla*, and the Blue water-lily *(Nymphœa gigantea*, Hook.) were the plants used. From these experiments it was seen that evaporation was neither retarded nor hastened.

Oil floating in a thin layer on the surface, however, hindered evaporation very considerably.

Artificial dams and reservoirs of any kind should of course be made as deep as possible with the object of preventing the water becoming hot, and as presenting the least surface for evaporation.

Brisbane, May 9th, 1893.

NOTES AND EXHIBITS.

A slab of white argillaceous sandstone was exhibited by Professor David, showing at least five, possibly nine or ten, leaves of the fossil fern *Glossopteris* attached to a thick stem, showing prominent leaf-scars. The specimen was obtained from the Western Coalfield, between Mudgee and Merriwa, and was presented to the Geological Department of the University of Sydney by M. J. C. McTaggart, B.E., of the Water Conservation Branch, Department of Mines. The discovery of this specimen is likely to throw important light on the structure and affinities of what was probably the predominant and most important member of the flora of the productive Coal-Measures of New South Wales, Queensland, Southern Africa, India and China.

Mr. Froggatt showed specimens and drawings of galls and coccids described in his paper. Also examples of a fungoid growth upon the scales of an homopterous insect which attacks the leaves of a Eucalypt, from Sutherland, near Sydney.

Mr. Rainbow exhibited specimens of a remarkable spider, at present undetermined, from Waterfall and from the Clarence River.

Mr. Maiden exhibited for Dr. Bancroft a photograph of a flourishing pot plant of *Marsilea Drummondii* grown by him.

WEDNESDAY, JULY 26TH, 1893

The President, Professor David, B.A., F.G.S., in the Chair.

DONATIONS.

"Gesellschaft für Erdkunde zu Berlin — Zeitschrift." Bd. xxviii. (1893), No. 1: "Verhandlungen." Bd. xx. (1893), Nos. 4-5. *From the Society.*

"Perak Government Gazette." Vol. vi. (1893), Nos. 13-16. *From the Government Secretary.*

"Department of Mines and Agriculture, New South Wales—Annual Report, 1892-93." *From the Hon. the Minister for Mines and Agriculture.*

"Catalogue of South Australian Minerals." By H. Y. L. Brown, F.G.S., Government Geologist. *From the Author.*

"Pharmaceutical Journal of Australasia." Vol. vi. (1893), No. 6. *From the Editor.*

"Zoologischer Anzeiger." xvi. Jahrg., Nos. 420-421 (May-June, 1893). *From the Editor.*

"Société Belge de Microscopie—Bulletin." T. xix. (1893), Nos. 6-7. *From the Society.*

"Société d'Horticulture du Doubs, Besançon—Bulletin." Nouvelle Série, No. 29 (May, 1893). *From the Society.*

"University of Sydney—Calendar for 1893": "Chancellor's Address" (April 8th, 1893). *From the Senate.*

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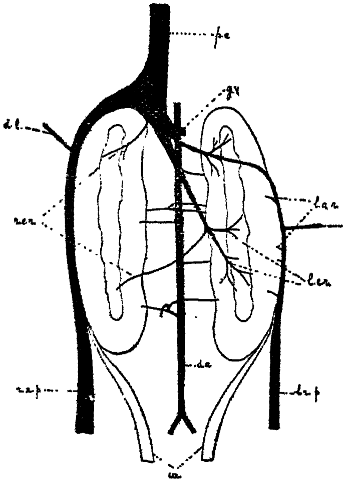
PAPERS READ.

NOTE ON AN ABNORMAL CONNECTION OF THE RENAL-PORTALS IN A YOUNG MALE FROG *(LIMNODYNASTES PERONII).*

By Jas. P. Hill, F.L.S.

In this specimen dissected in the Biological Laboratory, Sydney University, the renal-portal of each side was in direct connection with the post-caval. Each femoral vein divided in the usual way into pelvic and renal-portal veins. The pelvics were exceedingly large, and united in the normal way to form the anterior abdominal. The renal-portal of the right side (r.r.p. in figure) was also very much enlarged. It passed forwards, skirting the outer dorsal border of the kidney, but instead of dying away anteriorly it was continued on as a well-marked vessel which passed round the anterior border of the kidney and became continuous with the post-caval. No afferent renal vessels could be made out either in the fresh state or after injection, and sections of the kidney also failed to reveal their presence. The renal-portal of the left side (l.r.p.) was a much smaller vessel and more normal in appearance. It passed along the outer border of the kidney of that side in the usual way,



p.c., post-caval ; *r.r.p.* and *l.r.p.*, right and left renal-portals ; *l.a.r.*, left afferent renals ; *r.e.r.* and *l.e.r.*, right and left efferent renals ; *d.l.*, dorso-lumbar ; *d.a.*, dorsal aorta ; *g.v.*, genital vein ; *ur.*, ureters.

giving off a number of afferent renal veins (l.a.r.). Its anterior end, however, was continued as a small vessel which passed across the ventral surface of the kidney a short distance from its anterior end. It received two small factors from the kidney and then entered the post-caval some distance behind the point of union of the right renal-portal with that vessel.

The inter-renal portion of the post-caval was singularly asymmetrical. Instead of lying medianly between the two kidneys and arising from two sets of symmetrically disposed efferent renal vessels, it took its origin from the ventral surface of the left kidney, some distance from its posterior end, receiving as it passed obliquely forwards over the ventral surface, several small efferent renal vessels (l.e.r.) from the kidney substance. The efferent vessels from the right kidney (r.e.r.) were represented by, at the most, two vessels; of these the anterior one entered the post-caval opposite the point of union of the left renal-portal with that vessel. The posterior one joined the post-caval at the point where it left the ventral surface of the left kidney.

On the right side the vessel bringing back the blood from the dorsal body wall passed back obliquely and entered the renal-portal some distance behind its connection with the post-caval. On the left side the corresponding vessel entered the renal-portal, about the level of the middle region of the kidney, the more usual condition. The blood from the testes and fatty bodies entered the post-caval by a well-marked vessel (g.v.) just in front of the point of union of the left renal-portal with the post-caval.

Taking into consideration the great size of the pelvics and of the right renal-portal, the absence of right afferent renals and the small size of the inter-renal part of the post-caval, very little blood seems to have passed through the kidneys, and especially through the right one, the greater part of the blood from the posterior extremities passing into the enlarged pelvics, part also passing along the right renal-portal directly into the post-caval. The blood-supply of the left kidney seemed more normal, since distinct afferent renals were present, and since the afferent renals which in great part made up the inter-renal portion of the post-caval arose from it.

This connection of the renal-portals with the post-caval has some significance from a developmental point of view. Hochstetter has shown* that the post-caval vein of amphibia is to be regarded as a compound vessel and due to the fusion of an unpaired pre-renal portion formed independently of the cardinals, with an inter-renal portion formed by the fusion of the posterior portions of the posterior cardinals; and he figures the stages in the development of these and other parts of the venous system in *Salamandra atra*. In the youngest condition the posterior cardinals are shown as arising from the bifurcation of the caudal vein. Then in the region of the kidneys the cardinal of each side splits into a loop of two longitudinal vessels. On the fusion of the undivided portions of the cardinals anterior to the kidneys, the two inner vessels lose their posterior connection and form, together with the fused cardinals, the inter-renal portion of the post-caval. The outer limbs of the two loops lose their anterior connection with the cardinals and form two longitudinal vessels (Jacobson's veins), which constitute the renal-portals. Jacobson's veins are later joined posteriorly by the iliacs in the frog, and the renal-portal of the adult is thus constituted.

The condition in the specimen under consideration is thus seen to be due to the persistence in the adult of the original anterior connection between Jacobson's veins and the posterior cardinals, now fused to form the posterior part of the post-caval.

Howes has described† a specimen of *Rana temporaria* in which the anterior portion of the posterior cardinal persisted on the left side, forming an azygos vein, with which the renal-portal of that side was in direct communication. In my specimen no traces of azygos veins were present, and since it shows in the adult the persistence by arrested growth of a condition usually passed through in the larval state, I have thought it worth recording.

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* Morph. Jahrb. Bd. xiii. p. 160.

† Proc. Zool. Soc. Lond. 1888, p. 122.

ON A NEW SPECIES OF COCCID ON FERN-ROOTS.

By W. M. Maskell.

(Communicated by A. Sidney Olliff.)

(Plate VII. figs. 1-4.)

I received some months ago from Mr. A. Sidney Olliff six specimens of a coccid found at Kurrajong Heights in New South Wales by Messrs. J. J. Fletcher and C. T. Musson on roots of *Doodia aspera.* Various causes have prevented me from thoroughly examining these specimens until lately, but having now been able to do so, I find that they belong undoubtedly to the Lecanid group, and their subterranean habit and six-jointed antennæ place them in the genus *Lecanopsis*, Targioni-Tozzetti, of which two or three European species are known. The present insect differs from these in size and colour, as well as in its much more convex and rugose form; and I therefore propose to consider it as a new species.

Group LECANIDINÆ.

Subdivision LECANIDÆ.

Genus Lecanopsis, Targioni-Tozzetti.

Insects subterranean, attached to roots of grass or other plants; adult females presenting the normal abdominal cleft and lobes, and with antennæ of six joints. Feet present. Mentum monomerous.

Lecanopsis filicum, sp.nov.

Adult female dark-red-brown; dorsum very convex, the height being nearly equal to the length; ventral surface flat or slightly concave, with small patches of white cotton between it and the root; margin elliptical, slightly flattened. Abdomen exhibiting a shallow cleft with the usual two dorsal lobes; but the cleft is scarcely noticeable, being hidden by the dorsal convexity. Cephalic region comparatively smooth; abdominal region conspicuously segmented. The body at gestation becomes full of eggs and partially developed larvæ. Antennæ short, rather thick, conical, with six short subequal joints, of which the last bears a few hairs. Feet also short, partly atrophied, the joints somewhat swollen; claw very small. Rostrum moderate; mentum monomerous.

Early stages and male not observed.

Hab.—Kurrajong Heights, New South Wales; under ground, on rhizome and roots of *Doodia aspera.*

The six-jointed antennæ may be considered as a sufficient character for the separation of *Lecanopsis* from *Lecanium;* the subterranean habitat would not by itself suffice.

EXPLANATION OF PLATE.

Lecanopsis filicum.

Fig. 1.—Root of *Doodia,* with insects.
Fig. 2.—The same, enlarged.
Fig. 3.—Antenna of female.
Fig. 4.—Foot of female.

ON A NEW SKINK LIZARD FROM TASMANIA.

By C. Frost, F.L.S., and A. H. S. Lucas, M.A., B.Sc.

Hemisphæriodon tasmanicum, sp.nov.

Snout short, obtuse. Frontonasal broader than long, in contact with the rostral; præfrontals forming a median suture; three supraoculars; six supraciliaries; a series of small intraorbitals; from one to four pairs of nuchals; fifth upper labial entering the orbit.

Ear-opening round, smaller than the eye-opening. Scales smooth, twenty-six round the middle of the body. Adpressed limbs widely separated. Tail cylindrical, about as long as the head and body.

Colour: Dark olive-brown above; undersurfaces greyish or brownish; throat immaculate; tail with a series of dark wavy narrow transverse bands.

Dimensions: Total length, 207 mm.; head, 16 mm; width of head, 11 mm.; body, 87 mm.; fore limb, 17 mm.; hind limb, 23 mm.; tail, 104 mm.

Locality: About Lake St. Clair, Tasmania (collected by Professor Spencer).

Hemisphæriodon has been so far a monotypic genus, including only the banded species, *H. gerrardii*, Gray, occurring in Queensland. The present species has the aspect of *H. gerrardii*, but is at once distinguished from it by the uniform coloration. The enlarged lateral tooth on each side of each jaw while distinctly larger than the other teeth cannot be termed enormous by comparison with them. The special interest in the species is its affinity to the Queensland species. Of course the genus may be met with hereafter in intermeidate localities, but we have not seen it in Victoria, nor is there a record of its occurrence in New South Wales. We have, it will be remembered, a similar but even more remarkable distribution in the case of *Physignathus lesueurii*, where the same species occurs in Queensland and in Gippsland streams, but not in the intervening rivers.*

These remarks were based on the information given as to localities in the B. M. Catalogue (second edition). Subsequently we ascertained that both the species referred to have been recorded from the Clarence River, N.S.W., *H. gerrardii* by the late Mr. Krefft ("Australian Vertebrata," 1871) and *Physignathus* by Dr. Günther [Ann. Mag. Nat. Hist. (3), xx. p. 51 (1867)].

DESCRIPTION OF A NEW CYSTIGNATHOID FROG FROM NEW SOUTH WALES.

By J. J. Fletcher.

In March, 1887, Mr. A. G. Hamilton kindly sent me a large and remarkable frog (♂) from the Blue Mts., new to me, whose systematic position it was a somewhat perplexing matter to settle. With the tympanum distinct, the vomerine teeth between the inner nostrils, and the pupil vertical, it was evidently very nearly allied to *Heleioporus* and *Chiroleptes* as at present defined—and to one apparently about as closely as to the other, yet without being satisfactorily referable to either, for the first finger is not opposite to the others whereas the tympanum is very distinct. As only one specimen was forthcoming, and it was not possible to decide how far the distinctness of the tympanum was merely an individual character; and also as *H. albopunctatus*, Gr., had been recorded by two European authors as a Sydney frog—as I now think on erroneous grounds—the best course seemed to be to refer Mr. Hamilton's frog provisionally and with some doubt to Gray's species, and I accordingly did so.

Some time afterwards I had under observation, for the first time, living specimens of what was evidently *Chiroleptes platycephalus*, Gthr., and one of *C. australis*, Gr.; and in these I noticed that the pupil was horizontal and not vertical as mentioned in the B. M. Catalogue. On sending a well-preserved specimen to Mr. G. A. Boulenger with a statement of my difficulty, that gentleman with his usual courtesy kindly looked into the matter, and he has recently informed me that a horizontal and not a vertical pupil is correctly attributable to *Chiroleptes*. This point being settled, it is now clear that Mr. Hamilton's frog is more closely allied to *Heleioporus* than to *Chiroleptes*, as indeed from the more striking resemblance to the former in habit one instinctively felt.

Until recently all efforts to acquire additional information or specimens have been unsuccessful; but in July of last year Mr. W. W. Froggatt one day brought me a living specimen evidently of the same species but of the other sex, quite as large as Mr. Hamilton's example and with the tympanum just as distinct, but with the skin less shagreened and without horny tubercles on the fingers. This specimen was found under a heap of leaves in an orchard at Thornleigh, near Sydney; and it became very interesting to know that this fine species was a member of the batrachian fauna of the County of Cumberland. A few weeks ago Mr. R. Helms brought me a third specimen, a juvenile about half grown, forwarded by one of our Members, Mr. L. Woolrych, of Dural, near Parramatta, who found it six inches below ground; this individual also has the tympanum distinct. Finally last April I was fortunate in finding a fourth specimen near Manly; and like the three earlier specimens it was discovered quite by accident. I had been out for a day's ramble without having met with anything of particular interest, but on the way home when walking along a bush track which I have often traversed I came to a little creek crossing the track and running after recent rain when my attention was aroused partly by an unfamiliar subterranean noise, evidently that of a strange frog though hardly to be called a croak, and partly by the sight of a large frothy patch of spawn which seemed to be worth investigating. Finally close by the spawn I found a hole in the bank out of which in response to the necessary stimulus there presently emerged, to my great satisfaction, the fine frog (♂) exhibited alive at our last Meeting.

With four specimens at command, three of which have been under observation while living, there is no longer any room for doubt that the distinct tympanum is a constant character in this frog; and hence the necessity for regarding the species not only as distinct from *H. albopunctatus*, Gr., but as not even referable to the genus *Heleioporus* as at present defined. Speaking of the auditory organ in the *Cystignathidæ* Mr. Boulenger says "it exhibits all the possible degrees of development. Several genera, viz. *Crinia*, *Hylodes*, &c, prove that too great an importance has been attached to the modifications of this organ, and in most cases I must refuse to admit them as generic characters." It may be that it is attaching undue weight to the character "tympanum concealed" to rank it as of generic importance in *Heleioporus.* On the other hand two species of the genus are already known, and the character in question is allowed due weight in discriminating *Cryptotis* and *Phanerotis;* and therefore as the definition of the genus, as it at present stands, excludes the frog now under consideration the best course open to me seems to be to propose a new genus for it.

Reference has already been made to the fact that *Heleioporus albopunctatus*, Gr., has by two authorities been recorded as a Sydney frog, namely in the second edition of the British Museum Catalogue, and by Keferstein in his well-known paper—records the correctness of which I believe to be open to doubt on the following grounds. Mr. Krefft knew this frog well enough; nevertheless in his three lists of Australian frogs published during the years 1867-71 he gives as the habitat of *H. albopunctatus* King George's Sound; or Western Australia (particularly King George's Sound), Murray River, North Australia (?); or West and North Australia* : never does he include it among the species known to occur in New South Wales. Nor have local collectors of a later date been any more successful in finding it in this colony. It is very remarkable therefore that the single specimen from Sydney in the British Museum should stand recorded in the Catalogue as presented by Mr. Krefft; and that Keferstein's five supposed Sydney specimens should have been part of a collection supplied either by Mr. Krefft himself or by the late Dr Schuette who in his turn probably obtained all, or all but the Sydney specimens forwarded by him, from Mr. Krefft. Moreover the last of Mr. Krefft's papers appeared in "The Industrial Progress of New South Wales" published about the middle of 1871, whereas Keferstein's is to be found in Archiv für Naturgesch. xxxiii. Jahrg. 1 Bd., on the title-page of which the year of publication is given as 1868. Whether some of the material was supplied without localities being given, and, as has so often been the case with other Australian animals, the writer having received it from Sydney thereupon concluded that that was the correct habitat and so recorded it; or whether Mr. Krefft was sometimes careless in labelling the specimens sent to his correspondents, it is needless to inquire. The fact remains that several of the localities given by Keferstein are unquestionably wrong. For example, besides *H. albopunctatus* he records from Sydney *Limnodynastes salminii*, *L. ornatus* (both as *Platyplectrum marmoratum* and *P. ornatum*), and *Hyla nasuta* (as well as *H. freycineti* with which Mr. Krefft would appear to have confounded it in recording *H. nasuta* as a Sydney species); whereas these species, as far as I am aware, are not to be found within the County of Cumberland nor yet even in the adjacent counties. *Crinia georgiana*, D. and B., for a purchased specimen recorded as from Sydney in the B. M. Catalogue*; and *Hyla gracilenta*, Gthr., recorded from Sydney in Dr. Boettger's "Katalog der Batrachier-Sammlung im Museum der Senckenbergischen naturforschenden Gesellschaft in Frankfurt a.M." (1892), have in my opinion no better claim for recognition as Sydney frogs. In fact it is quite evident that if the Batrachian fauna of Sydney really included all the species with which at different times by different authors it has been credited, it would comprise a very considerable proportion of all the species recorded from Australia. And *H. albopunctatus* and *Crinia georgiana* as I think should therefore be eliminated from the list of New South Wales frogs.

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* Evidently Mr. Krefft is only quoting most of these localities on the authority of Dr. Günther [B. M. Catalogue (first edition) and Ann. Mag. Nat. Hist. July, 1867 (3), xx. p. 54]; not so, however, in regard to King George's Sound.

Little is known of the habits of *H. albopunctatus*. Like the Sydney frog described below it is evidently a burrower of very retiring habits, for Mr. Masters, Curator of the Macleay Museum, has been good enough to inform me that during a visit of some eight months' duration to West Australia in the year 1866 when collecting for the Australian Museum he met with this species only once, at King George's Sound after a thunderstorm with heavy rain succeeding an intensely hot day in April, when the frogs appeared in great numbers. Mr. Masters secured as many as he wanted, but he says that without much trouble he could have got a thousand individuals if he had wished. The next day they had disappeared, and he never encountered the frog again. The specimens obtained were brought to Sydney, and were possibly included in the "340 specimens referable to 39 Species of Reptiles" mentioned in the Annual Report for 1869 as added to the Australian Museum Collection as the result of Mr. Masters' visit to West Australia. From this source not improbably came the specimens of this species which Mr. Krefft distributed to his correspondents.

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* Still earlier [for the same specimen] by Dr. Günther [Ann. Mag. Nat. Hist. l.c. p. 53], a locality for this species never adopted by Mr. Krefft.

PHĪLOCRYPHUS, n.g.

Allied to *Heleioporus* and *Chiroleptes;* differing from the former chiefly by the distinct tympanum; and from the latter by the vertical pupil, and the first finger not opposite to the others; as in both the diapophyses of the sacral vertebra are slightly dilated.

P. FLAVOGUTTATUS, n.sp.

Habit stout. Tongue subcircular, slightly nicked and free behind. Vomerine teeth in a transverse interrupted series between the choanæ. Head broader than long; snout rounded, shorter than the orbital diameter; without canthus rostralis; nostril obviously nearer the eye than the tip of the snout; interorbital space not quite so broad as the upper eyelid, the latter warty; tympanum very distinct, about two-thirds the diameter of the eye, usually with a few small warts. Fingers blunt, free; first finger longer than second; a tubercle between the first and second, and the second and third fingers as in *L. dorsalis:* toes short, blunt, with a thick distinct basal webbing; subarticular tubercles present, those of the fingers larger than those of the toes; inner metatarsal tubercle only present, large, compressed, blunt. Limbs short, stout; the tibio-tarsal articulation of the adpressed hind limb reaching to about the shoulder. Skin very glandular warty above; on the sides the warts more individualised, less confluent, a number of them lighter coloured, yellow during life; a short fairly defined light-coloured glandular ridge, yellow in life, above the angle of the mouth below the tympanum: beneath smooth, but with a few small scattered pale warts about the chin and throat. Upper surfaces purplish-grey or bluish-black, in spirit tending to become olive-brown, the sides of the body and the region about the vent much spotted with yellow, the light tint of contiguous papillæ sometimes confluent; belly white, throat dusky. Male without vocal sac, with the skin more shagreened, many of the papillæ on the sides and throat having a black horny capping, and in the breeding season with a longitudinal row of from seven to ten or fewer acute black horny conical tubercles on the upper surface of the first, second, and third fingers, of which the proximal one on the first finger is very large.

Three adults 79-85 mm. from snout to vent; one (juv.) 38 mm.; two of the adults are preserved in a more or less completely distended condition, measuring 61 and 65 mm. respectively across the loins.

Hab. County of Cook—Mt. Victoria, Blue Mts. *(Mr. C. Hamilton):* County of Cumberland—Thornleigh *(Mr. W. W. Froggatt)*, Dural near Parramatta *(Mr. L. S. Woolrych)*, near Manly *(J J.F.)*.

Apart from the distinct tympanum, and the more glandular warty upper surface, this species appears to differ from *Heleioporus albopunctatus*, Gr., in respect of the glandular ridge below the tympanum, in the nostril being nearer the eye than to the tip of the snout, in the secondary sexual characters of the male, and apparently by the absence of parotoids of which I can find no trace. Cope* figures the sternum of *H. albopunctatus* as undivided, narrowing posteriorly; Keferstein, however, figures it as broadening posteriorly and notched slightly; *Philocryphus* has it more widely and deeply notched than in Keferstein's figure, quite a bay in fact (in one specimen 5 mm. broad and about as deep), with narrow xyphisternal horns.

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* Batrachia of North America, pl. LXX. fig. 18.

Being unable to carry the ova on the occasion of finding the frog, I went again on the first opportunity a week later, in the hope also of getting the female. The spawn outside the hole had failed to develop, but inside, which was partly below the level of the water, was a considerable mass in good condition.

The ova like those of *Pseudophryne* are unusually large, and the embryo has a large yolk sac; the ova are not however laid as by that species in damp places out of the water, but in large white frothy masses like the spawn of *Limnodynastes dorsalis* or *Hyla aurea*, but with the noticeable difference in the size of the individual ova. Unlike the embryos of *Pseudophryne* those of *Philocryphus* acquire large external gills before hatching, and they are ready for hatching in a shorter time (about a fortnight); from observations upon these I feel satisfied as to the correctness of my formerly expressed opinion that *Pseudophryne* embryos do not acquire functional external gills. It will be interesting to know how far *Heleioporus* and *Chiroleptes*—concerning whose life-history nothing is known at present—share in this interesting peculiarity, as at present I know of no other Cystignathoid frog with spawn of this character.

The habit of distending itself, sometimes spontaneously, always when tickled or scratched on the back, is very marked in this species. *Limnodynastes dorsalis*, *Chiroleptes platycephalus*, and *Notaden bennettii* likewise have it, and they are all burrowers. Secondarily it may be of some protective value as a deterrent to their enemies; but it is possibly of prime importance in their burrowing operations. Several times when keeping these frogs in a vivarium with several inches of loose earth on the bottom they entirely disappeared, leaving the surface so level and apparently undisturbed that without actually unearthing them their exact whereabouts was not evident.

Sometimes both the fingers and toes have apparently swollen tips; these, however, as it seems to me, are merely callosities due to wear and tear perhaps in burrowing in hard ground in a dry season.

It is remarkable that this fine species has been so long overlooked: it seems to be rare, as I have never met with similar spawn before; it is evidently shy and of very retiring habits, and where I got my specimen there was so much cover that the chance of finding specimens except by accident seemed hopeless; added to which I know of no describable croak that I can in any way connect with the frog. Nevertheless, as Mr. Woolrych noticed and reported, when the Dural specimen had his back stroked he would usually lift up his voice in a very ludicrous and surprising manner.

SOME NEW SOUTH WALES PLANTS ILLUSTRATED.

By R. T. Baker, Assistant Curator, Technological Museum, Sydney.

(Plate ix.)

No. vi. Acacia subulata, Bonpl., B.Fl. ii. 370.

A tall glabrous shrub, attaining 10ft. or more, with erect slender slightly angular branches. Phyllodia narrow-linear, mucronulate, narrowed at the base, 3 to 6in. long, scarcely 1 line broad in some specimens, straight or nearly so, rather thin, 1-nerved. Flower-heads several, globular, small, in slender axillary racemes, the peduncles almost filiform. Flowers about 12 to 20, very small, mostly 5-merous. Calyx thin, turbinate, usually toothed, fully half as long as the corolla, peduncles smooth.

Pod (previously unrecorded) from 2 to 6 inches long, about 4 lines broad, flat, thin, glabrous, and nearly straight.

Seeds ovate-longitudinal, funicle very long, dilated and coloured almost from the base, very flexuose, more or less encircling the seed in double folds.

Loc.—Forests of the Goulburn River. The specimen figured came from Bylong Creek, on the upper course of the Goulburn River.

EXPLANATION OF PLATE IX.

Fig. 1.—Flowering specimen (nat. size).
Fig. 2.—Unexpanded flower.
Fig. 3.—Expanded flower.
Fig. 4.—Pod (nat. size).
Fig. 5.—Seed.
Fig. 6.—Pistil.
Fig. 7.—Phyllode (enlarged).
Fig. 8.—Bracts.

All enlarged to various extents except Figs. 1 and 4.

NOTES AND EXHIBITS.

Mr. Maiden exhibited flowering and fruiting specimens of *Acronychia acidula*, F.v.M., from the Richmond River. It is a plant new for New South Wales, having been recorded hitherto only from Queensland.

Mr. North exhibited a specimen of *Platycercus pennantii*, received from Dr. P. Herbert Metcalfe, the Resident Medical Officer on Norfolk Island. This bird was separated from the continental form by Canon Tristam under the name of *P. pennantii*, var. *nobbsi*, on account of its smaller size, upon the suggestion and receipt of specimens from Mr. E. L. Layard, who stated all his birds of this species were the same size. The specimen forwarded by Dr. Metcalfe is in immature plumage, but actually exceeds in its length of wing and tarsus typical Australian examples, thus confirming the opinion of Count Salvadori in his Catalogue of the Psittaci, who states that he found no difference in the size of the insular from the continental form, except that a specimen from Norfolk Island was even larger than any from Australia, and who ranks *P. nobbsi* as a synonym of *P. elegans*, of Gmelin (*P. pennantii*, of Lath.), our well-known Australian species (Brit. Mus. Cat. Vol. xx. 1891).

Mr. North also exhibited specimens of *Graucalus melanops*, Lath., and *Ardea novæ-hollandiæ*, Lath., recently obtained by Dr. Metcalfe for the first time on Norfolk Island.

Mr. Lucas exhibited a specimen of the new Tasmanian lizard; specimens of a Victorian frog (*Pseudophryne semi-marmorata*), and fossil plants from Joadja Creek, among them an interesting specimen showing impressions of sori.

Mr. Froggatt exhibited specimens of the galls of *Cecidomyia nubilipennis*, Sk., previously unrecorded, from Flemington, on the leaf-stalks of *Eucalyptus siderophloia*, and of the gnats bred therefrom.

Mr. Baker sent for exhibition flowering and fruiting specimens of *Acacia subulata* figured in his paper, from the Upper Goulburn

River, N.S.W., and from Auburn fruiting specimens of *A. pubescens*, a species of which the characters of the fruit have not been recorded.

Mr. Hedley exhibited a specimen of *Nautilus pompilius* found by Mr. Whitelegge stranded on the beach at Curl Curl Lagoon, near Sydney, and he remarked that instances of this species drifting ashore on our coast had been recorded by Mr. Brazier, in the Catalogue of Marine Shells of Australia and Tasmania, p. 18. It has also been noticed by Mr. Johnston as wrecked on the Tasmanian coast. On the Queensland seaboard the speaker had frequently remarked it. There it is highly prized by the aborigines, who trade the shells as ornaments from tribe to tribe; the time for its occurrence is said by the natives to coincide with the blossoming of the Bloodwood tree (*Eucalyptus corymbosa*). Associated with the Pearly Nautilus among the sea-drift on the northern coast are cocoanuts, so fresh as to be eagerly devoured by the blacks, and pumice stone. The nuts might have floated from any tropical island in the Pacific; the Nautilus shells are derivable from the narrower limits of the Solomons, the Fijis, and the New Hebrides, while the pumice would seem to be the product of the active volcanoes of the New Hebrides. The agent which strews these foreign products on Australian coasts is probably not an ocean current, but the north-east trade-wind.

Mr. J. Mitchell, Narellan, contributed the following "Note on the discovery of the genus *Estheria* in the Upper Coal Measures of N.S.W.":—

On July 3rd inst., from beneath the second coal seam at Bellambi, in a cherty rock I obtained a very good specimen of the above, associated with *Glossopteris linearis* and *G. browniana (?)*. It is worthy of note that this *Estheria* occurs associated with the same typical species of *Glossopteris* in the Illawarra district as the allied genus *Leaia* is found associated with in the Newcastle district; that the character of the rocks in each case is identical or nearly so, and that the relative positions as compared with the coal seams in each locality are equally in concurrence.

WEDNESDAY, AUGUST 30TH, 1893.

Professor Haswell, M.A., D.Sc., Vice-President, in the Chair.

Mr. Norman H. Hardy, Sydney, Mr. J. Alexander Watt, B.A., Sydney University, and Dr. Arthur Dendy, F.L.S., Melbourne University, were elected Members of the Society.

DONATIONS.

"Royal Microscopical Society—Journal, 1893." Part 3. *From the Society.*

"University of Melbourne—Examination Papers": Matriculation, November, 1889; Annual, October and December, 1889; Final Honour, Degrees, &c., February, 1890; Annual, October and December, 1891; Final Honour, Degrees, &c., February, 1892; Annual, October and December, 1892. *From the University.*

"Zoologischer Anzeiger." xvi. Jahrg. Nos. 422-424 (June-July, 1893). *From the Editor.*

"Pharmaceutical Journal of Australasia." Vol. vi (1893), No. 7. *From the Editor.*

"Department of Mines, Victoria—Annual Report for the year 1892." *From the Hon. the Minister for Mines.*

"Naturwissenschaftlicher Verein zu Bremen—Beilage zum xii. Band" (1893). *From the Society.*

"Société d'Horticulture du Doubs, Besançon — Bulletin." Nouvelle Série, No. 30 (June, 1893). *From the Society.*

"Marine Biological Association of the United Kingdom—Journal." Vol. iii. (New Series), No. 1 [1893]. *From the Association.*

"Department of Agriculture, Victoria—Handbook of the Destructive Insects of Victoria." Part ii. By C. French, F.L.S. (1893). *From the Secretary of Agriculture.*

"Société Impériale des Naturalistes de Moscou—Bulletin." Année 1893, No. 1. *From the Society.*

Pamphlet entitled—"The Glacier Epoch of Australia." By R. M. Johnston, F.L.S. (1893). *From the Author.*

Four conchological pamphlets (1893). By E. A. Smith, F.Z.S. *From the Author.*

"Perak Government Gazette." Vol. vi. (1893), Nos. 16-18. *From the Government Secretary.*

South Australia—"Additional Silurian and Mesozoic Fossils from Central Australia." By R. Etheridge, Junr. *From the Government Geologist.*

"United States Department of Agriculture—Division of Entomology—Bulletin." No. 30 (1893). *From the Secretary of Agriculture.*

"American Museum of Natural History—Bulletin." Vol. v. (1893) Sheets 6-8, pp. 81-128. *From the Museum.*

"Zoological Society of Philadelphia — Twenty-first Annual Report" (1893). *From the Society.*

"Société Royale des Sciences, Upsal—Nova Acta." Ser. iii. Vol. xv. Fasc. 1 (1892). *From the Society.*

"Société Belge de Microscopie—Annales." T. xvii. 1er Fasc. (1893). *From the Society.*

"Journal of Conchology." Vol. vii. No. 7 (June, 1893). *From the Conchological Society of Great Britain and Ireland.*

"Verein für Erdkunde zu Leipzig—Mitteilungen, 1892." *From the Society.*

"Department of Agriculture, Brisbane—Bulletin." Nos. 23-24 (March and May, 1893). *From the Under-Secretary for Agriculture.*

"Archives Néerlandaises des Sciences Exactes et Naturelles." T. xxvii. 1re et 2^{me} Livs. (1893). *From the Dutch Society of Sciences, Haarlem.*

"Johns Hopkins University Circulars." Vol. xii. No. 107 (June, 1893). *From the University.*

"Australian Museum, Sydney—Report of the Trustees for 1892." *From the Trustees.*

Two conchological pamphlets. By Professor Ralph Tate and J. Dennant, F.G.S., F.C.S. (1893). *From Professor Tate, F.G.S.*

"Victorian Naturalist." Vol. x. No. 4 (August, 1893). *From the Field Naturalists' Club of Victoria.*

"Comité Géologique, St. Pétersbourg—Carte Géologique de la Russie d'Europe" (1893). *From the Committee.*

"Bombay Natural History Society—Journal." Vol. viii. No. 1 (1893). *From the Society.*

"College of Science, Imperial University, Japan—Journal." Vol. v. Part 4 (1893). *From the University.*

"Australasian Journal of Pharmacy." Vol. viii. No. 92 (August, 1893). *From the Editor.*

Pamphlet entitled— "Notes and Analysis of a Metallic Meteorite from Moonbi, N. S. Wales." By J. C. Mingaye, F.C.S. *From the Author.*

"Edible Fishes and Crustaceans of New South Wales" (1893). By J. Douglas Ogilby, F.L.S. *From the Author.*

"Agricultural Gazette of N.S.W." Vol. iv. Part 7 (July, 1893). *From the Hon. the Minister for Mines and Agriculture.*

"Royal Society of London — Proceedings." Vol. liii. Nos. 322-324. *From the Society.*

"Linnean Society of London—Journal: Zoology." Vol. xxiv. Nos. 152-154 (1892-93); "Botany." Vol. xxix. Nos. 202-204 (1892-93); "List of Fellows, &c." (1892). *From the Society.*

"Linnean Society of London—Transactions." Second Series "Botany." Vol. iii. Nos. 4-8 (1892-93): "Zoology." Vol. v. Nos. 8-10 (1892-93). *From C. Hedley, Esq., F.L.S.*

"Académie Royale des Sciences et des Lettres de Danemark, Copenhague—Bulletin pour 1892," No. 3; 1893, No. 1. *From the Academy.*

PAPERS READ.

NOTE ON *COLINA BRAZIERI*, TRYON.

By Professor R. Tate.

The above-named gastropodous shell is described in Tryon's Manual of Conchology, Vol. ix. p. 142, and illustrated, t. 26, fig. 16. The occurrence of *Colina* in the Eocene beds of Victoria has led me to a study of the recent species, and in doing so I was arrested by the unlikeness of Tryon's figure, as above quoted, to other members of the genus; moreover, the shell seemed familiar to me, and if I am right in my identification it is nothing more than the embryo of *Fusus proboscidiferus*, of which I have examples from Port Essington. The apical whorls of that shell are often decollated, but in some specimens there remains sufficient of the apex to permit one to arrive at the opinion just stated.

Tryon says of it—"An aberrant form almost deserving to be made the type of a new group. The extreme fragility and form of the mouth indicate juvenility. Mr. Brazier sent us several specimens which all exhibit the above [diagnostic] characters."

Colina, classed by Tryon and Fischer as a section of *Cerithium*, is most related to *Lovenella*, as indicated by Cossmann, Coq. Foss. de l'Eocene de Paris, 1889, which the same authors make a section of *Cerithiopsis;* indeed, specimens of fossil species, under examination, with an incomplete aperture are only distinguishable from *Lovenella* by the absence of that abrupt twist of the columella which characterises that genus, and in this state is simulated by *Colina Brazieri.*

NOTES ON AUSTRALIAN COLEOPTERA, WITH DESCRIPTIONS OF NEW SPECIES.

By the Rev. T. Blackburn, B.A., Corr. Mem.

Part XIV.

LAMELLICORNES (CETONIDES).

Dilochrosis Frenchi, sp.nov.

Ovalis; splendide viridis, antennis tarsisque piceis, capite subtus prosterno coxis femoribusque anticis capillis fulvis ornatis; clypeo sat angusto sat elongato antice vix emarginato, fortiter crebre punctulato; capite postice lævi; antennarum clava quam articuli ceteri conjuncti subbreviori; prothorace sat transverso, in medio sparsim subtiliter ad latera magis crebre sat fortiter punctulato (puncturarum interstitiis subtilissime confertim punctulatis), postice quam antice plus quam duplo latiori, postice lobato (quam *Hemipharis* vix minus fortiter), lobi profunde emarginati angulis rotundato-obtusis; scutello ut *Hemipharis* conformato confertim subtilissime punctulato; elytris et confertim subtilissime et distincte (quam *Hemipharis insularis* multo magis fortiter) seriatim punctulatis, latera versus sat distincte transversim strigatis apicem versus ut *H. insularis* callosis, pone humeros parum sinuatis; pygidio concentrice sat fortiter strigato; mesosterni processu fere ut *H. insularis* sed ad apicem subreclinato; tibiis anticis extus sat fortiter tridentatis, posterioribus extus infra medium spina fere ut *D. atripennis*, Macl. armatis; tarsis fere ut *Hemipharis insularis*. [Long. 13, lat. 7 lines.

The long and acuminate mesosternal process and strongly lobed prothorax of this species associate it with *Hemipharis*. M. Lacordaire considered *Hemipharis* a mere section of *Schizorrhina*,

but more recently Dr. Kraatz and M. Thomson have not only treated it as a distinct genus but have formed other genera at its expense. Some of these latter are, I think, very unsatisfactorily characterised, and founded on slight characters, even colour being treated as generic. Strictly speaking, this present insect cannot be referred to any of them, as its uniform metallic colouring distinguishes it from all except *Hemipharis* itself, while its scarcely emarginate clypeus and spinose posterior tibiæ are inconsistent with a place in that genus as limited by the abovenamed authors. I am unwilling, however, to propose a new genus, both because subdivision appears to me already to have been carried rather to an extreme in this group and because it is possible I may have overlooked some generic name of non-Australian species. As there is nothing except colour in this insect absolutely inconsistent with a place in *Dilochrosis* as briefly characterised by M. Thomson, and as (apart from the form of the clypeus, which, according to the diagnosis, is variable in that genus) it seems to me nearly related to *Schizorrhina atripennis*, Macl., structurally, which Dr. Kraatz says is a *Dilochrosis*, I am probably not far wrong in adopting that name. The colour of this insect is a very dark but extremely brilliant green, and I know no other *Schizorrhinid* bearing much resemblance to it. Its extremely short apical ventral segment and pygidium strongly gibbous hindward indicate its being a male.

N. Queensland; in the collection of C. French, Esq.

DIAPHONIA LATERALIS, sp.nov.

Sat nitida; ferruginea, capite (clypei disco ferrugineo nigro-bimaculato) prothorace (lateribus exceptis) elytris (marginibus ad latera et apicem, basi summa et costa suturali exceptis late ferrugineis) pygidii basi propygidio corporis subtus suturis metasterni lateribus genubus tibiis tarsisque nigris vel nigro-piceis; capite (parte mediana postica sublævi excepta) sat fortiter sat crebre punctulato; prothorace obsolete (valde leviter, in medio sparsissime vix manifeste latera versus paullo magis crebre minus leviter) punctulato; scutello puncturis nonnullis subobsoletis impresso; elytris obscure costatis, inter costas inæqualiter sat crasse punctulatis, latera versus fortiter transversim rugatis; pygidio fortiter gibboso longitudinaliter sulcato (sulco in medio interrupto), concentrice strigato; corpore subtus fulvo-hirto.

[Long. 13, lat. $7\frac{3}{5}$ lines.

The elytral sculpture is about as coarse as in *Diaphonia Parryi*, Jans., but considerably less close. The elytral costæ are much like those of *Metallesthes metallescens*, White, but evidently a little stronger; the intervals between the costæ are not in the least sulciform. The hinder part of the suture is strongly and narrowly carinate, but is not spiniform at the apex.

I cannot refer this species to any of Dr. Kraatz' genera. It comes nearest, I think, to *Chlorobapta*, of which, however, the green colour of the elytra is made a character (the name being derived from it). But apart from colour, this insect differs from *Chlorobapta (e.g.*, *C. frontalis*, Don.) in the form of its mososternal process, which is different from that of any other *Cetonid* known to me. This process is of triangular form, the apex of the triangle being directed hindward and fitted into an emargination of the metasternum, and its base (the longest side of the triangle) forming the front of the process, which is consequently truncate in front, this truncate front margin of the mesosternal process being as wide as the distance from eye to eye across the front of the head, but projecting forward very little more than does the mesosternal process of *C. frontalis*. The typical example is evidently a male; its antennal club is about as long as the clypeus; its front tibiæ are unarmed externally; its four posterior tibiæ have a median blunt projection (scarcely a spine), the ventral segments are widely concave longitudinally (more widely and less deeply than in *C. frontalis*), its clypeus scarcely differs from that of *frontalis* except in being more strongly (but not very deeply) and triangularly emarginate in front and with somewhat more upturned margins, its prothorax is very like that of *frontalis* in all respects except in its sides being considerably more divergent hindward near the base (concealing the summit of the mesothoracic

epimera), its elytra are very much more strongly emarginate behind the shoulders, so that the humeral lobes are very much more prominent (they are as in *Cacochroa gymnopleura*, Fisch.); the scutellum (being wide at the base) forms an equilateral triangle.

Queensland; in the S. Australian Museum.

DIAPHONIA EUCLENSIS, sp.nov.

Sat nitida; nigra, prothorace (macula bene determinata magna discoidali plus minus trapezoidali et linea basali angusta exceptis) scutelli disco et elytris (lineis tenuibus suturali et laterali, hac a basi vix ad medium extensa, exceptis) flavo-testaceis; capite postice pygidio et corpore subtus sat dense cinereo-hirsutis; capite dense rugulose punctulato; prothorace sat crebre dupliciter (puncturis magnis et nonnullis multo minoribus intermixtis, latera versus gradatim nonnihil crassioribus) vix rugulose punctulato, linea dorsali lævi instructo; scutello utrinque juxta basin fortiter punctulato; elytris sat crasse inæqualiter punctulatis et plus minusve obsolete costulatis; pygidio concentrice strigato.

♂. Tibiis anticis inermibus vel obtuse vix manifeste infra medium dentatis, intermediis inermibus, posticis infra medium dente parvo armatis; abdomine longitudinaliter concavo; antennarum clava elongata.

♀. Tibiis anticis externe fortiter tridentatis, intermediis dente acuto posticis dentibus 2 (superiori minuto) armatis; abdomine æqualiter convexo; antennarum clava brevi.

[Long. 13-14, lat. 6½-6¾ lines.

The sculpture throughout is extremely like that of *Hemichnoodes Mniszechi*, Jans., except that that of the scutellum is confined to the anterior corners, leaving the middle line and the apex broadly lævigate, whereas in *H. Mniszechi* it is continuous across the base. The suture is only slightly carinate behind (though more so than in *H. Mniszechi*) and is not in the least protuberant at the apex. The mesosternal process is of the shape usual in *Diaphonia* (*D.*

Parryi, *dorsalis*, &c.), but is a little larger than in most of its congeners; it is extremely nitid and bears a few conspicuous punctures about its apex (in *H. Mniszechi* it is very similar in form and size but is coarsely punctulate throughout). The antennal club in the male is as long as the clypeus, in the female considerably shorter. The clypeus is somewhat deeply and triangularly emarginate in front, with moderately thickened sides (scarcely differing from that of *D. Parryi).* The prothorax is trapezoidal in the male, with its front margin less than half as wide as the base, but in the female is less narrowed in front with the sides a little more rounded. The mesothoracic epimera are moderately visible from above (as in *D. dorsalis).* The post-humeral emargination, and the humeral lobes, of the elytra are as in *D. dorsalis;* and the scutellum is shaped as in *D. dorsalis*, *Parryi*, and others. The pygidium in both sexes is much larger and more protuberant than in *D. dorsalis.* On account of this last-named character it is possible Dr. Kraatz would place this insect in *Hemichnoodes*, but it does not agree with that genus in its other principal character (the form of the base of the prothorax), in respect of which it closely resembles *Diaphonia Parryi.* Indeed, I cannot regard *Hemichnoodes* as sufficiently distinct from *Diaphonia* to justify the formation of the genus, and should prefer to let *H. Mniszechi* remain in *Diaphonia*, where it was originally placed.

It is just possible that this species may be a variety of *Diaphonia (Schizorrhina) nigriceps*, Blanch., which is too briefly characterised for certain identification (though I believe a very different insect in my collection to be Blanchard's species); the prothorax of *D. nigriceps*, however, is described as having some "obsolete darker (than the general fulvous colour) median spots," with which the present insect does not at all agree, the prothorax of the (half dozen or so) specimens that I have seen having its entire disc occupied by one more or less exactly trapezoidal sharply defined black spot, which is so large as to leave merely a moderately (and somewhat equally) wide margin of the fulvous groundcolour on all sides. If it should prove to be a var. of *D. nigriceps*, it would still, I think, be convenient for it to bear a distinctive name. The description of *D. nigriceps* scarcely refers to anything except colour, size, and markings.

S.W. Australia; Eucla district.

DIAPHONIA SATELLES, sp.nov.

♂. Minus convexa; sat nitida; nigra, prothoracis lateribus (et exemplorum nonnullorum marginibus ceteris) elytris (vitta lata suturali mox ante apicem utrinque recurva excepta) pygidioque (apice summo excepto) testaceis; corpore subtus (præsertim ad latera) pedibusque (tarsis exceptis) pilis elongatis pallide fuscis vestitis; capite sat opaco dense rugulose, prothorace sat fortiter (in disco sparsim, ad latera sat crebre) nullo modo rugulose, punctulatis; scutello ad latera puncturis sat magnis nonnullis impresso; elytris sat crasse sat inæqualiter punctulato-striatis, interstitiis nonnullis leviter convexis; pygidio concentrice strigato; tibiis anticis extus plus minusve obsolete 3-dentatis, intermediis extus 2-dentatis, posticis extus crenulatis et dentibus 2 majoribus armatis; abdomine longitudinaliter concavo; antennarum clava quam clypeus longiori; prothorace postice quam antice multo plus quam duplo latiori, lateribus pone apicem manifeste coarctatis.

[Long. 10, lat. 6 lines.

♀. A mari differt forma convexa, elytris nigris vitta discoidali (postice plus minusve abbreviata) testacea ornatis; prothoracis disco scutelloque magis crebre punctulatis; illo postice quam antice vix magis quam duplo latiori; tibiarum omnium dentibus majoribus, tarsis brevioribus; abdomine æqualiter convexo; antennarum clava quam clypeus breviori.

[Long. 9-11, lat. 5½-6 lines.

The male and female are so unlike each other that it is only lately I have become satisfied of their specific identity. The two forms occur in the same localities, and of one I have seen only males, of the other only females. Mr. Tepper adds information which seems conclusive to the effect that he bred both forms from a small batch of pupæ that he obtained at the root of a tree. The principal differences are in the male being an unusually depressed *Diaphonia*, while the female is a very convex one, and in the male elytra being bright testaceous with the suture more or less widely blackish (the blackish vitta thus formed being dilated in a curve, or sending out a short curved branch on either side a little in front of the apex), while the elytra of the female are black with a more or less short testaceous vitta running from the middle of the base hindward. It should be noted that the upper surface of the hind body is testaceous in both sexes and that its testaceous colour is continued in some examples on to the edges of the ventral segments, also that I have seen one male in which there are two testaceous spots on the clypeus.

The sculpture and pubescence of this insect are almost exactly as in *D. dorsalis*, Don., and its male bears a good deal of resemblance to the male of *dorsalis* in general appearance. It is, however, more depressed, with its prothorax considerably more transverse and its elytra of different shape, being considerably narrowed hindward from immediately behind the base. The sutural stria does not (as it does in *dorsalis*) commence on the base of the elytra and follow the outline of the scutellum, but commences immediately *behind* the scutellum. The suture is very decidedly, though not very strongly, carinate, but is not at all protuberant at the apex. The mesosternal process is a little longer and more prominent than in *dorsalis*, with its sides more parallel. The antennal club is much shorter. The clypeus is scarcely different except in being more closely punctulate. The mesothoracic *epimera* are less conspicuous from above. The humeral lobes are a little less prominent. Besides the above specified distinctions from *dorsalis*, the dark markings of the upper surface are very different, that of the prothorax being much larger and differently shaped, the sutural vitta of the elytra being prolonged to the apex, &c., and the shoulders being devoid of a dark spot; also the tibiæ are differently dentate.

S. Australia; Port Lincoln; York's Peninsula, &c.

TENEBRIONIDÆ.

CHALCOPTERUS PULCHER, Blackb. (*antea*, p. 78).

The mention of the habitat (Queensland) was accidentally omitted.

AMARYGMUS RUTILIPES, Blackb. (*antea*, p. 100).

The mention of the habitat (N. S. Wales; Blue Mts.) was accidentally omitted.

CURCULIONIDÆ (BRACHYDERINÆ).

PROSAYLEUS COMOSUS, Germ.

Either this insect is one of a series of very closely allied species (most of them as yet undescribed) or it is extremely widely distributed in S. Australia and variable to the last degree. I believe the latter to be the case, as, with a considerable series before me, I find that although specimens may be selected which on a casual glance it is scarcely possible to believe conspecific with each other, yet no definite character appears to distinguish them, and, moreover, they are connected by intermediate forms in the most puzzling manner.

The following characters are common to all the specimens I am considering :—prothorax with the sides well rounded (that of the male more elongate and with less strongly rounded sides than that of the female), elytra clothed with rather long erect setæ, conjointly narrowly rounded at the apex, and having their shoulders rounded.

The size varies from long. 2¾ to long. 4 lines, and it is difficult to find two specimens in which the scales form an identical pattern. The most constant marking (which seldom varies much except by abrasion) is a narrow flexuous line of whitish scales on each side of the prothorax. In one form the prevalent scales of the upper surface are dark fuscous and the lighter scales are quite silvery-white, forming (besides the prothoracic lines mentioned above) on each elytron a narrow sutural vitta, a spot near the scutellum, and a wide lateral vitta (suddenly dilated about the middle of its length). In successive examples the fuscous scales become paler and the light scales more greyish till they come to almost the same colour, when the surface presents a pale fawn colour with the markings not much paler, and then in other examples all the markings of the elytra except the lateral ones are nearly wanting. I have examples before me in which the groundcolour is dark fuscous and there is only the feeblest indication of the markings, but I think these are all more or less abraded, or at least old and faded. It is quite possible that I am mistaken in associating all these forms, especially as there seems to be some variation (apart from sex) in the transversity of the prothorax, but after a good deal of consideration I find myself quite unable to discover stable characters for subdividing them.

PROSAYLEUS INTERMEDIUS, sp.nov.

Oblongo-ovatus; piceo-niger, squamis griseis albidisque intermixtis et setis erectis sat brevibus sat validis vestitus, antennis pedibusque (femoribus subinfuscatis exceptis) sordide testaceis; scapo ultra oculum manifeste attingenti; rostro quam caput vix longiori carina mediana instructo; prothorace sat transverso sat crasse ruguloso, lateribus rotundatis, postice truncato antice subemarginato; scutello vix manifesto; elytris (? fem. sol.) quam prothorax fere duplo latioribus sat fortiter punctulato-striatis, interstitiis (exemplorum plus minusve abrasorum) sat convexis. [Long. $2\frac{3}{4}$, lat. $1\frac{1}{10}$ lines.

The examples examined appear all to be females, and none of them have any distinct markings, the scales being dull grey obscurely mottled with a paler tint. None of them are very fresh, and it is likely that freshly taken specimens are more or less distinctly and probably very variably marked with a pattern; probably also the convexity of the elytral interstices is little apparent in quite fresh specimens. The characters of this species, however, are quite independent of the squamosity, which is probably too variable to be available for identification. The scape of its antennæ is evidently longer than in *P. comosus*, Germ., and considerably longer than in *P. Hopei*, Schönh., reaching when set back slightly (but distinctly) beyond the back of the eye; the colour of the antennæ, tibiæ, and tarsi is very distinctly (though not *brightly)* testaceous; the front margin of the prothorax in the middle is distinctly raised and emarginate, and the erect setæ of the upper surface are considerably shorter and stouter than those of *P. comosus*, and about as much longer than those of *P. Hopei.*

I may remark that I believe I know *P. dispar*, Germ., but am not sufficiently confident of the identification to specify its differences from *P. intermedius*, except in respect of characters that are definitely mentioned in the description, among which are the very short erect setæ of its upper surface and the truncate front margin of its prothorax.

The other described species of the genus—*P. ateropterus*, Schönh.,—I do not think that I have seen; if it were not that Schönherr says its rostrum is non-carinate, it might be a dark var. of *P. comosus*, in which case Germar's name would have to be dropped.

Kangaroo Island; taken by Mr. Tepper.

MALEUTERPES (gen.nov. *Brachyderinarum).*

Caput latum convexum; rostrum quam caput brevius, sat robustum; scrobes rectæ transversæ ab oculis distantes; oculi modici sat rotundati; antennis prothoracis basin vix attingentibus, scapo oculi marginem posticum attingentibus, funiculo 7-articulato, articulis basalibus 2 quam ceteri longioribus, clava distincta brevi; prothorax antice et postice subtruncatus; scutellum distinctum; elytra prothorace sat latiora; pedes sat elongati sat robusti, coxis anticis nonnihil sejunctis, femoribus sat incrassatis (♂ anticis dente elongato spiniformi armatis), tibiis intus ad apicem fortiter mucronatis (♂ intus basin versus dente elongato spiniformi armatis, ♀ intus sinuatis), corbulis posticis apertis, tarsis sat brevibus, unguiculis connatis; metasternum modicum; segmenta ventralia 3-4 brevia.

The very small species for which I found this genus is remarkable by its anterior coxæ not contiguous, the presence of a large tooth on the front femora and tibiæ of the male, and the mucronate apex of its four anterior tibiæ. It seems to be near *Eutinophœa*, which, however, differs from it *inter alia* by its straight tibiæ and contiguous front coxæ. The head of *Maleuterpes* is very like that of *Eutinophœa* as represented in Trans. Ent. Soc. 1870, t. 5, fig. 6, a-b.

MALEUTERPES SPINIPES, sp.nov.

Rufo-fuscus, antennis (clava excepta) pedibusque rufis; supra squamis fuscis cinereisque variegatim ornatus, subtus dense argenteo-cinereo squamosus; prothorace vix transverso, lateribus rotundatis; elytris punctulato-striatis, humeris distinctis, basi subtruncata, interstitiis alternis manifeste convexis. [Long. 1½, lat. ⅗ line.

The scales form a more or less distinct variegated pattern. In a well marked example the fuscous scales may be taken as the groundcolour, the cinereous scales covering the legs, the rostrum, and the front and sides of the prothorax, and forming on the elytra a patch on each shoulder and a fascia behind the middle, immediately in front of which the fuscous scales are almost blackish.

N. S. Wales.

EUTHYPHASIS PARVA, sp.nov.

Ferruginea antennis tarsisque piceis, nonnullorum exemplorum corpore toto (elytris femoribus tibiisque exceptis) picescenti; squamis cinereis sparsim vestita; rostro quam latiori fere duplo longiori; squamis in prothorace trilineatim condensatis; hoc quam latiori sat longiori, capite sat crebre nec grosse ruguloso; elytris punctulato-striatis, ad apicem spiniformibus valde productis, singulis macula mediana obliqua albida ornatis. [Long. 3, lat. ⅖ line.

Much like *E. acuta*, Pasc., but *inter alia* much smaller, and having the antennæ entirely blackish.

Victoria; sent to me by Mr. French.

ACALONOMA PUSILLA, sp.nov.

Fusco-ferruginea, corpore subtus rostroque obscuris, squamis cinereis obsolete viridescentibus sat dense vestita; rostro quam latiori duplo longiori; capite prothoraceque sat crebre nec grosse ruguloso; hoc quam latiori paullo longiori; elytris punctulato-striatis, ad apicem breviter spiniformibus, interstitiis planis. [Long. 1½, lat. $\frac{3}{10}$ line.

Very near *A. reducta*, Pasc., but *inter alia* much smaller, and with the elytral interstices not convex; *A. reducta* also has variable black colouring (on the prothorax, suture, &c.) which I do not find in any of the examples of this species before me.

Victoria; sent by Mr. French.

OPHTHALMORYCHUS (gen.nov. *Rhadinosomo* affine).

Elongatum; subcylindricum; caput subcylindricum, quam latius sesquilongius; rostrum capiti longitudine æquale, cum capite æqualiter continuum, a basi usque ad apicem dilatatum, scrobes rectæ valde profundæ oblique deorsum directæ subtus conniventes; antennæ quam caput (rostro incluso) vix longiores, scapo oculum haud attingenti funiculo 7-articulato, articulis omnibus sat brevibus, clava distincta oblonga acuminata; oculi rotundati parvi laterales fortiter granulati longe a prothorace remoti, lamina (ex capite exserta) nonnulla ex parte operti; prothorax minus elongatus (specei typicæ leviter transversus), lobis ocularibus nullis; elytra valde elongata (specei typicæ rostro capite prothoraceque conjunctis longiora) mox ante apicem subito angustata et conjunctim anguste rotundata; coxæ anticæ contiguæ; prosternum ante coxas leviter concavum; metasternum valde elongatum; segmenta ventralia basalia 2 conjuncta quam apicalia 3 subbreviora; femora vix pedunculata; tarsi sat breves sat paralleli, articulo 3° sat fortiter bilobo, unguiculis liberis divergentibus.

The very small insect for which I propose this new name is among the most remarkable *Curculionides* that I have seen. It is very difficult to place in the *Curculionid* series, but I think it is certainly allied to *Rhadinosomus*, another anomalous form. Its distinctive prothorax (only about $\frac{1}{7}$ of the whole length of the body) gives it a most peculiar facies, and the structure of the head and rostrum are no less abnormal, the former extruding on either side a kind of process like a flap, which lies partly over the eye from behind that organ, and the latter dilating gradually forward from its base in such fashion as to bear a certain resemblance to a funnel, the wide end of which is the apex of the rostrum.

In the Lacordairean classification of the *Curculionides* its place is among the *Brachyderides*, if it can be considered Adelognathous (which I cannot make it out to be, but neither does *Rhadinosomus* appear so to me, though Lacordaire places it in the *Brachyderidæ*). If it be not Adelognathous, I can suggest no better place for it than somewhere near the *Aterpides*, though I know no *Aterpid* in the least resembling it.

OPHTHALMORYCHUS ANGUSTUS, sp.nov.

Elongatus; subcylindricus; piceus, indumento squamoso cinereo dense tectus, antennis nigris; capite rostroque sulco mediano continuo impressis; hoc sparsim pergrosse punctulato; prothorace leviter transverso, antice sat angustato, obscure bisulcato, lateribus pone medium rotundatis; elytris obscure seriatim punctulatis, interstitiis alternis carinatis.

[Long. $2\frac{1}{5}$, lat. $\frac{2}{5}$ line.

Victoria; Alpine district.

RHADINOSOMUS TASMANICUS, sp.nov.

Piceus vel rufo-piceus, antennis nigris; opacus; capite pone oculos minus elongato, crebre rugulose punctulato; funiculi articulo basali quam 2^{us} fere duplo longiori; prothorace fere cylindrico, paullo pone apicem latiori, in medio leviter incurvato, toto rugulose punctulato, parte basali transversim rugulosa; elytris quam prothorax fere duplo latioribus, costulatis, interstitiis transversim sat crasse fastigiatis, apicibus breviter divaricatim productis maculis singulis parvis obscuris aureis ornatis. [Long $4\frac{1}{2}$, lat. $\frac{4}{5}$ line.

The opaque coarsely sculptured surface, very short apical "tails" of the elytra, and the basal joint of the funiculus nearly twice as long as the 2nd joint render this species very distinct from its described congeners. In some examples the spot of golden scales on the elytra is entirely wanting—perhaps owing to abrasion—but I am not sure these do not represent a distinct species, as their elytral "tails" are more slender and spine-like and quite devoid of hairs.

Tasmania.

RHADINOSOMUS FRATER, sp.nov.

Rufo-piceus, tibiis dilutioribus, capite antennisque nigricantibus; minus opacus; capite pone oculos retrorsum gradatim angustato, grosse punctulato (interstitiis subtiliter transversim rugatis); funiculi articulis basalibus 2 longitudine sat æqualibus; prothorace quam caput angustiori, ut præcedentis conformato, antice sparsim minus fortiter punctulato postice subtiliter transversim rugato; elytris quam prothorax paullo latioribus, costulatis, interstitiis transversim sat subtiliter fastigiatis, apicibus divaricatim minus breviter productis, singulis macula obliqua mediana laterali ornatis.

[Long. $1\frac{1}{2}$, lat. $\frac{3}{10}$ line (vix).

This species is distinguished from all the previously described Australian *Rhadinosomi* by its head gradually narrowed from the eyes hindward. This character, however, approximates it to the New Zealand *R. acuminatus*, Fab., from which, however (as redescribed by Mr. Waterhouse, Trans. Ent. Soc. ii.), it differs *inter alia* by the sculpture of its head, which in *R. acuminatus* is said to have a large shallow fovea between the eyes and to be coarsely punctured in front of the eyes and transversely furrowed on the posterior part, whereas the head of the present insect is not foveate between the eyes and is equally coarsely punctured on its whole surface (less closely behind than in front of the eyes), with no transverse sculpture except under a strong lens some fine strigosity of the interstices of the punctures. Mr. Waterhouse says that the example he described was reported by the Rev. F. W. Hope to have been named by Fabricius himself.

Victoria.

(OTIORHYNCHINÆ.)

MERIMNETES ÆQUALIFRONS, sp.nov.

Piceus, squamis obscure cinereis dense vestitus; fronte æqualiter leviter convexa; rostro antice albido-squamoso; prothorace antice vix angustato, ruguloso, lateribus sat rotundatis; elytris punctulato-striatis, interstitiis vix convexis.

♂. Elongato-angustus, elytris quam prothorax parum latioribus.

♀. Minus angustus, elytris quam prothorax sat latioribus.

[Long. 2⅓, lat. ⅘-1 line.

This species is much like *M. uniformis*, Boh., but may be at once distinguished from it by the absence of the longitudinal sulcus between the eyes and the evidently less convexity of the eyes. The scales clothing the surface are of a dark ashy colour, except on the front of the rostrum, where they are almost white.

N. S. Wales; Blue Mountains.

PSOMELES.

I have in my collection examples of a Tasmanian species which appear to me to be probably *P. oblongus*, Blanch. That they are really congeneric with the insect from Tahiti on which the genus *Psomeles* was founded is highly improbable I should say, but I think they are certainly congeneric with *Merimnetes uniformis*, Boh. *Psomeles* is an older name than *Merimnetes*, so that if *P. oblongus*, Blanch., be a true *Psomeles* the name *Merimnetes* would, I think, have to be dropped.

TELENICA.

The following species may I think be placed in this genus, although, as is usually the case with Mr. Pascoe's genera, there are characters introduced into the generic diagnosis which it seems to me out of the question to regard as generic, and which are not found in the subject of this description. The principal discrepancies are in the antennæ and the prothorax. According to description the antennæ of *Telenica* are "elongate" (without any more precise specification of their length), but in the description of the several parts of the same the scape is said to extend back to the front margin of the prothorax, which indicates their being much shorter than in some allied genera (e.g. *Titinia* and *Epherina*). In the insect before me the scape is of the length attributed to that of *Telenica* (which I should call "short" rather than "elongate"), and the rest of the antennæ bearing about the usual proportion to the scape the whole antenna is only about half as long as the whole insect, which I do not think can be rightly called "elongate." In the diagnosis of *Telenica* "prothorax transversus" is given as a generic character; but I cannot think it is rightly treated as such; in the species before me the length and width of the prothorax are equal by measurement (to the eye the length appears greater than the width).

The following are characters in respect of which this species agrees well with the diagnosis of *Telenica:* rostrum not particularly short, narrowed in the middle and with cavernous subapical scrobes which do not extend as far as to the eye; scape of antennæ straight; basal two joints of funiculus longer than the others; prothorax truncate at the base and having strongly rounded sides; scutellum wanting; tarsi moderately elongate; claws free but approximate.

To a casual glance this insect is suggestive, I think, of the *Leptopsides* rather than the *Otiorhynchides*, but its round eyes placed at a distance from the prothorax, together with the complete absence of ocular lobes, require it to be referred to the latter group, in which its short metasternum, open hind corbels, and free claws seem to associate it with the true *Otiorhynchides;* if not admitted to *Telenica* it would, I think, require a new generic name.

TELENICA SUBFASCIATA, sp.nov.

Picea, antennis pedibusque subferrugineis; squamis fuscis cinereis et obscure aurantiacis intermixtis dense vestita; oculis sat magnis minus depressis; prothorace vermiculato-ruguloso, antice sat angustato, lateribus sat fortiter rotundatis, longitudine latitudini æquali; elytris subovatis quam prothorax sat latioribus, punctulato-striatis, interstitiis sat latis subconvexis. [Long. $2\frac{2}{5}$, lat. 1 line.

The cinereous scales have a slight *greenish* tone about the sides of the elytra. On the rostrum and underside the scales are almost entirely cinereous; on the prothorax the cinereous scales may be regarded as the groundcolour, and the fuscous scales as forming a large obscure dorsal spot occupying almost the whole width at the base and with its sides arcuately converging to a point on the front margin; on the elytra the fuscous scales form the groundcolour, the dull orange scales clothe the suture, and the front part of the alternate interstices and the cinereous scales form two indistinct fasciæ, which are joined on the lateral margin a little in front of the middle, whence one of them runs obliquely forward towards the scutellum, and the other obliquely hindward. Each interstice bears a row of fine semi-erect setæ, the individual setæ being of two colours, fuscous and whitish.

The prothorax not wider than long will separate this species from the previously described members of the genus.

W. Australia; taken by E. Meyrick, Esq.

PROXYRUS GIBBICOLLIS, sp.nov.

♂. Niger, squamis cinereis fuscisque intermixtis vestitus; rostro supra longitudinaliter concavo, parte concava carina mediana longitudinali instructa; prothorace valde gibboso (quam *P. lecideosi*, Pasc. multo magis fortiter), utrinque ante medium fere tuberculatim tumido quam elytra latiori, sparsim punctulato; elytris punctulato-striatis, ad basin recurvis et mox pone basin transversim leviter impressis, ad apicem truncatis.

♀. Prothorace multo minus gibboso; elytris postice latioribus; tibiis rufis. [Long. $3\frac{1}{2}$, lat. $1\frac{1}{10}$-$1\frac{1}{5}$ lines.

Differs from *P. lecideosus*, Pasc., by its peculiarly shaped prothorax, which is almost globular; viewed from the side the curve of the upper outline of the prothorax rises up high above the level of the elytra; a little on either side of the middle line and near the front there is a separate gibbosity independent of that of the general surface; the evidently (though slightly) turned up front margin of the elytra is also a good character. I have not seen *P. abstersus*, Pasc., but it is described as a larger insect, clothed with long setæ; my examples of this species are somewhat abraded but their vestiture does not seem to differ notably from that of *P. lecideosus*.

W. Australia; Carnarvon.

TIMARETA.

The diagnosis of this genus is thoroughly unsatisfactory, containing little definite information. The scape, for instance, is said to be "elongate" without its length being defined; and yet the genus is said to "lie between *Trachyphlœus* and *Asceparnus*," two genera having the scape shorter than in most *Otiorhynchid* genera, and is "differentiated" from them (not by the different scape but) "by the form of the posterior tarsi" without any description of what the form of the posterior tarsi is.

Reading the description of the species together with Mr. Pascoe's remarks on the genus, I think it is to be understood that its author referred the genus to the *Trachyphlœides*, and this being so (as no Australian species have been referred to other *Trachyphlœid* genera), I think the difficulties of the generic diagnosis may be overcome (or rather evaded)—pending a re-examination of the types—by provisionally attributing to *Timareta* all such Australian *Otiorhynchides* as appertain to the *Trachyphlœid* series, unless, of course, any should turn up presenting very definite distinctive characters.

The species described below are certainly, I think, *Trachyphlœides* with which apportionment their facies agrees more or less perfectly), although I do not think I should like to treat them all as congeneric if I could confidently assign any one of them in particular to *Timareta.* The species, however, which seem to me most likely to be typical *Timaretæ* (the first three described below) can hardly be referred to the *Trachyphlœides* without a remark on the peculiar form of their scrobes, which are neither thoroughly of the *Otiorhynchid* nor of the *Brachyderid* type, but somewhat intermediate between the two. They are not "linear," but neither are they thoroughly "foveiform," and while decidedly "arched" (the lower margin less strongly than the upper, but nevertheless decidedly) they are situated entirely in the upper half of the lateral face of the rostrum, so that their hinder portion, though certainly directed downward, does not reach quite so far downward as the middle of the eye. The following characters, however, which the species in question present in common with the others referred below to the *Trachyphlœides* are entirely in harmony with that reference: hind corbels open; metasternum short; claws free; antennæ shorter than in most of the *Otiorhynchides;* upper surface bearing short stout erect more or less clubbed setæ; tarsi short.

TIMARETA LINEATA, sp.nov.

Minus brevis, subovata; obscure fusca, antennis pedibusque rufescentibus; squamis fuscis et niveis intermixtis (his in elytris lineatim condensatis) et setulis crassis erectis brevibus curvatis pallidis vestita; rostro quam caput vix longiori haud angustiori, sat arcuato, a capite modice distincto; scrobes laterales arcuatæ; antennis sat brevibus, prothoracem vix superantibus, scapo oculum vix superanti setuloso; oculis parvis rotundatis parum prominulis grosse granulatis; prothorace leviter transverso, lateribus modice arcuatis; scutello vix distincto; elytris prothorace sesquilatioribus, subtiliter punctulato-striatis, ad basin sinuatis, interstitiis 1° 3° (hoc interrupte) 4^i basi 5° 6° (hujus parte basali excepta) et 7° niveis; prosterno antice subtruncato; segmentis ventralibus 3° 4°que sat brevibus; sutura 1^a ventrali minus arcuata; tarsis brevibus;

corpore subtus ferrugineo; processu intercoxali lato parallelo antice subtruncato. [Long. $1\frac{1}{2}$, lat. $\frac{7}{10}$ line.

The sculpture is almost entirely invisible owing to the density of the scales clothing all parts.

S. Australia; taken under stones on York's Peninsula, on sandy ground near the sea.

TIMARETA CONCOLOR, sp.nov.

Præcedenti affinis; oculis magis prominulis; prothorace vix transverso; sutura 1ª ventrali magis fortiter arcuata; fusco-ferruginea squamis concoloribus et setulis ut præcedentis vestita. [Long. $1\frac{1}{2}$, lat. $\frac{3}{5}$ line.

In all structural characters not mentioned above this species agrees perfectly with the preceding, but besides being very differently coloured and entirely devoid of markings, the distinctions indicated in the diagnosis are clearly specific. In *T.* (?) *lineata* the eyes project so little from the sides of the head that they are scarcely visible when the insect is viewed from above, while in *T.* (?) *concolor* they are very visible indeed when similarly inspected.

S. Australia; Eyre's Peninsula.

TIMARETA MUNDA, sp.nov.

Ovalis; picea; squamis piceo-brunneis cinereisque intermixtis tecta, et setulis erectis robustis clavatis minus elongatis pallidis vestita; rostro scrobibus antennis oculis prothoraceque ut *T. lineatæ* conformatis; elytris brevioribus minus parallelis, interstitiis minus latis. [Long. $1\frac{1}{5}$, lat. $\frac{2}{5}$ line.

The cinereous scales are condensed to form on the prothorax two narrow longitudinal lines and on the elytra a short line on either side of the scutellum, while on all the interstices except those near the suture they form a number of small spots; these markings, however (in the unique type which does not seem to be abraded), are not at all conspicuous as compared with the snowy-white markings of *T. lineata.* From that species the present one is distinguished also by the different pattern formed by its scales and its much smaller size and less parallel form. From *T. concolor* it differs (as does *T. lineata)* by its less prominent eyes, shorter prothorax, &c. From *T. figurata,* Pasc., and *satellina,* Pasc., it differs *inter alia* by its prothorax not longer than wide, and from *T. crinita,* Pasc., by its much smaller size, &c.

S. Australia; York's Peninsula.

TIMARETA PUSILLA, sp.nov.

Breviter ovata; picea, squamis cinereis et fuscis intermixtis et setis brevibus pallidis erectis vestita, antennis rufescentibus; rostro crasso quam caput haud longiori haud angustiori, a capite sulco transverso distincto; scrobibus lateralibus foveiformibus; antennis prothoracis basin vix attingentibus, scapo oculum vix superanti setuloso; oculis modicis, sat rotundatis, minus convexis, grosse granulatis; prothorace sat transverso, lateribus rotundatis; scutello haud manifesto; elytris prothorace sesquilatioribus, indistincte punctulato-striatis; prosterno antice vix emarginato; segmentis ventralibus 3° 4°que brevibus; sutura 1^{a} ventrali arcuata; tarsis brevibus; metasterno brevissimo. [Long. $\frac{9}{10}$, lat. $\frac{1}{2}$ line.

All sculpture (except indications of elytral striæ) is completely hidden by dense squamosity, consisting of fuscous and cinereous scales mottling the surface without any distinct pattern.

This species is extremely *Trachyphlœus*-like in form, differing *inter alia* however, from *Trachyphlœus* by the round foveiform scrobes and the transverse sulcus dividing the rostrum from the head. I do not think it altogether satisfactorily placed in association with the preceding three species, but, as I have said above, it seems best for the present to associate together as far as possible the Australian *Trachyphlœides,* leaving their generic treatment for future consideration. Mr. Pascoe has already set the example in this by placing in *Timareta* a species *(T. crinita)* which he says differs from the typical one in having the scape of its antennæ half again as long.

Victoria; sent by Mr. French.

TIMARETA SUBFASCIATA, sp.nov.

Ovalis, postice sat acuminata; piceo-brunnea, squamis brunneis cinereisque intermixtis confertim tecta et setulis erectis validis sat elongatis pallidis vestita; rostro crasso quam caput vix longiori, a capite sulco transverso modice distincto; scrobibus foveiformibus lateralibus nihilominus superne sat manifestis; antennis prothoracis basin vix superantibus, scapo prothoracis apicem attingenti setuloso; oculis ut præcedentis; prothorace leviter transverso, lateribus modice arcuatis; scutello haud manifesto; elytris antice posticeque angustis, lateribus pone basin fere rectis fortiter divergentibus hinc ad apicem arcuatim angustatis, punctulato-striatis, squamis cinereis utrinque juxta suturam ut linea longitudinalis brevis et pone medium utrinque ut fascia obliqua obscura suturam versus abbreviata condensatis; pedibus alternatim brunneo- et cinereo-annulatis; tarsis minus brevibus; metasterno quam præcedentium minus brevi; segmentis ventralibus 3° 4°que brevibus, sutura prima arcuata. [Long. 2, lat. $\frac{7}{10}$ line.

Probably Mr. Pascoe would not regard this species as congeneric with the preceding, but it seems to appertain to the *Trachyphlœides* (having open hind corbels, a short metasternum, free claws, comparatively short antennæ, and the surface clothed with erect bristles); its tarsi, however, are somewhat long as compared with those of the *Trachyphlœides*. It is easily recognisable specifically by the peculiar shape of its elytra, which are narrow at the base, the sides diverging for a short distance as straight lines, being at their widest not much behind the base, and thence converging arcuately to the apex. The annulated femora and tibiæ also are very distinctive, as also the distinct (though not very conspicuous) pattern of the elytra. In good specimens the sculpture is entirely hidden by the scales, but in abraded examples the prothorax is seen to be rugulosely punctured and the elytra strongly punctulate-striate with convex interstices.

S. Australia; Eyre's Peninsula.

MYLLOCERUS TORRIDUS, sp.nov.

Piceus, squamis cinereis confertim æqualiter vestitus; oculis parvis; antennis sat gracilibus, funiculi articulo basali quam 2^{us} paullo breviori; rostro quadrato quam caput haud angustiori; prothorace fortiter transverso antice sat fortiter angustato, lateribus subconcavis, basi fortiter bisinuata; elytris punctulato-striatis, interstitiis sat planis; femoribus omnibus dentibus singulis armatis. [Long. 2½, lat. 1 line.

In Mr. Pascoe's tabulation of the Australian species of *Myllocerus* (E.M.M. VI. 1869) this species falls beside *M. nasutus*, Pasc., from which it differs *inter alia* by its much smaller size and the 2nd joint of its antennal funicle longer than the basal joint. Also probably resembles *M. modestus*, Pasc., described subsequently to the tabulation, but not in terms precise enough to allow of its being placed in the tabulation. *M. modestus* seems, however, to differ from this species in its rostrum being "in medio excavatum" and in the interstices of its elytral striæ being "elevata"; in the present species the interstices are flat near the base, but become a little convex near the apex.

Northern Territory of S. Australia; Port Darwin.

MYLLOCERUS BOVILLI, sp.nov.

Piceus, squamis viridi-griseis fuscisque maculatim intermixtis vestitus, pedibus obscure rufo-testaceis; oculis sat magnis; antennis sat gracilibus, funiculi articulis basilibus 2 inter se æqualibus; rostro minus lato supra longitudinaliter concavo; prothorace quam longiori (et postice quam antice) plus quam duplo latiori, antice fortiter emarginato, lateribus vix arcuatis, basi fortiter bisinuata; elytris punctulato-striatis, interstitiis sat planis; femoribus anticis fere muticis; corpore subtus dense griseo-squamoso. [Long. 2-3, lat. $\frac{7}{10}$-$1\frac{1}{10}$ lines.

In a fresh specimen the greenish-grey scales may be taken as furnishing the groundcolour of the upper surface. The fuscous scales form the following markings—a very broad median vitta on the prothorax and a great number of elongate irregularly transverse blotches on the elytra so disposed that their total area is scarcely different from that of the greenish-grey scales (so that the elytra might almost as well be described as "fuscous, with a great number of elongate irregularly transverse greenish-grey blotches").

The emargination of the front of the prothorax would perhaps justify the creation of a new generic name for this insect, but as I cannot find any other structural peculiarity I think I may call it a *Mylloceru*s, of which genus it has entirely the facies.

In Mr. Pascoe's tabulation (referred to above) this species must stand, I think, beside *M. aphthosus*, Pasc., from which it differs *inter alia* by its smaller size and the entire absence of any "golden" tone of colour; also (presumably) by the emargination of the front of its prothorax. It also perhaps resembles *M. chrysideus*, Pasc., (not tabulated), but differs *inter alia* by its longitudinally concave rostrum. Herr Faust says that *M. chrysideus* is a *Cyphicerus* (S.E.Z. 1890, p. 66); however that may be, the present insect certainly cannot be referred to *Cyphicerus*, its hind corbels being open.

Northern Territory of S. Australia; taken by the late Dr. Bovill, at Port Darwin.

MYLLOCERUS SPECIOSUS, sp.nov.

Niger vel piceus, squamis nigro-fuscis et læte viridibus maculatim intermixtis vestitus, pedibus antennisque obscure rufescentibus; oculis sat magnis; antennis sat gracilibus, funiculi articulis basalibus 2 inter se sat æqualibus; rostro sat lato subquadrato, supra vix concavo linea subtili longitudinali elevata instructo; prothorace sat transverso antice leviter angustato, lateribus vix arcuatis, basi fortiter bisinuata; elytris punctulato-striatis, interstitiis vix planis; femoribus omnibus dentibus singulis armatis.

[Long. $2\frac{1}{5}$-$2\frac{4}{5}$, lat. $\frac{7}{10}$-1 line.

The blackish scales are the prevalent ones and form the ground-colour. The green scales are vaguely sprinkled over the head and rostrum, form a wide median vitta on the prothorax and densely clothe the sides of that segment, are condensed to form a number of spots irregularly placed all over the elytra and are vaguely spotted over the undersurface.

This species is characterised by the rich bright green (neither pale nor golden) of its squamose markings. In Mr. Pascoe's tabulation (referred to above) it must be placed, I think, beside *M. nasutus*, Pasc., owing to the form of its rostrum, which, however, is not quite so broad and quadrate as in *M. torridus*, Blackb. It does not seem to be very near any of the species from Cape York subsequently described by Mr. Pascoe. Abraded examples are almost black, and the elytral interstices in these are seen to be somewhat convex.

Sent by Mr. French as from Tasmania and W. Australia.

(EREMNINÆ.)

PEPHRICUS VITTATICEPS, sp.nov.

Obscurus, squamis fuscis testaceisque et setis suberectis recurvis vestitus, rostri apice et antennis plus minusve rufo-testaceis; rostro antrorsum minus angustato, supra sat plano, scrobibus supernis, approximatis; oculis ovalibus infra vix acuminatis; capite mediana vitta testacea ornato et oculis squamis testaceis intus marginatis; prothorace leviter transverso, lateribus modice arcuatis; scutello nullo; elytris quam prothorax tertia parte latioribus, basi leviter emarginatis, sat fortiter punctulato-striatis, lateribus modice rotundatis.

[Long. $1\frac{3}{4}$-$1\frac{4}{5}$, lat. $\frac{4}{5}$ line.

The structural characters are identical with those of *Pephricus squalidus*, Blackb., (Trans. Roy. Soc. S.A. 1892, p. 231), which this species much resembles but from which it differs *inter alia* by its considerably smaller size, the conspicuous testaceous markings of its head, and the better defined sculpture of its elytra. Regarding the fuscous scales as forming the groundcolour, the testaceous scales almost cover the rostrum and form the markings already described on the head, two interrupted vittæ on the prothorax, and a number of small spots on the elytra. The sculpture of the prothorax consists of closely placed large flat granules.

S. Australia; near Kapunda.

PEPHRICUS NANUS, sp.nov.

Præcedenti valde affinis, sed multo minor et colore obscurior; scrobibus supra minus approximatis. [Long. $1\frac{1}{2}$, lat. $\frac{3}{5}$ line.

The whole upper surface is of an almost uniform dull fuscous colour, with scarcely any indication of pattern, such indications as there are consisting of some indistinct small pale spots on the upper surface, of which the least indistinct are two at the base of the elytra placed one on either side of the scutellum. It is probable, however, that the scale-pattern varies in both this and the preceding species, but the difference in the scrobes is no doubt constant. In *P. vittaticeps* the scrobe (viewed from above) cuts the rostrum in such fashion that its inner outline on either side is deeply emarginate, and the scrobes are separated from each other by a strongly coarctate interval, the middle of which is much narrower than the ends; while in *P. nanus* the inner outline of the scrobes is nearly straight and so the scrobes are separated from each other by an interval which is scarcely narrower in the middle than at either end.

S. Australia; near Adelaide.

(LEPTOPSINÆ.)

CATASARCUS SERICEUS, sp.nov.

Breviter ovalis (ut *C. transversalis*, Germ.); piceus, antennis pedibusque rufescentibus; squamis subviridi-griseis confertim vestitus; rostro carina mediana nitida instructo; fronte subæquali, utrinque prope oculos carina tenui instructa et in medio antice longitudinaliter leviter impressa; funiculi articulo basali quam 2^{us} parum longiori; prothorace brevi crebre nec crasse ruguloso; scutello parvo; elytris æqualiter sat fortiter punctulato-striatis, transversim rugatis, interstitiis latis subconvexis. [Long. 5, lat. $3\frac{1}{5}$ lines.

The following characters in combination place this species in a small group of *Catasarci* consisting of the few species of the genus that are not recorded as exclusively Western Australian, viz.:—elytral scales evenly distributed, elytra without dorsal spines, form shortly ovate. Among the species of that group the following characters readily distinguish it—vestiture very dense and even and consisting of scales having a distinctly *greenish* tone, head almost even except in having a fine nitid carina on each side close to the eye and an elongate median impression not reaching back beyond the level of the middle of the eyes. The post-humeral tubercle is fairly well defined. The close-set scales give the insect a very silky appearance.

W. Australia.

CATASARCUS ARMATUS, sp nov.

Sat late ovalis; fuscus vel fusco-niger, antennis nigro-piceis; squamis ferrugineis albidisque vestitus; rostro robusto, lamina apicali ut carina elevata retrorsum continuata; capite antice obsolete trisulcato; funiculi articulis basalibus 2 elongatis inter se æqualibus; oculis minus late ovalibus; prothorace quam longiori duabus partibus latiori, sparsim obsolete tuberculato et obsolete transversim rugato, quam elytrorum basis sat angustiori, lateribus leviter arcuatis; scutello parvo triangulari; elytris a basi ultra medium transversim sulcatis, sulcorum interstitiis flexuosis et hic illic tuberculis parvis instructis, singulis tuberculis validis spiniformibus 5 armatis (sc. 1 posthumerali, 1 discoidali mox ante medium, 2 transversim positis mox pone medium, 1 quam ceteri multo majori juxta suturam ad partis declivis apicalis basin posito), humeris tuberculiformibus. [Long. 6½-7½, lat. 3½-4⅓ lines.

The example of this species described above is very sparingly supplied with scales, but I suspect that it and most (if not all) other *Catasarci* in such condition are more or less abraded (nevertheless this is the ordinary condition of *Catasarci* in collections and descriptions). Probably a perfectly fresh specimen is closely covered with mixed ferruginous and whitish scales, with the latter condensed in three vittæ on the prothorax and the former about the base and sides of the elytra. This insect may, however, be at once distinguished from all its hitherto described congeners by the number and arrangement of the spines on its elytra, which are (besides the usual post-humeral spine) as follows: three on each elytron placed in a series running obliquely hindward from the middle of the width (as seen from above) of the elytron a little in front of the middle of the length nearly to a point on the suture just above the hind declivity, and one placed just outside the middle spine of the oblique series.

The sculpture of the front half of the elytra, moreover, is less longitudinal and more transverse than in any other *Catasarcus* known to me; that of the hinder half consists of rows of large punctures filled with ferruginous or whitish scales, while the vestiture of the interstices is of a brownish colour.

W. Australia; Gnarlbine; sent by Mr. French.

POLYPHRADES ROSTRALIS, sp.nov.

♂. Sat breviter ovalis; piceus, dense cupreo-cinereo-squamosus, antennis (clava excepta) tibiis tarsisque subferrugineis; rostro subtilissime 3-carinatis (carinis sub squamas abditis), capite obscure sat sparsim punctulato; oculis elongato-ovalibus subtiliter granulatis; antennis in rostri parte superiori insertis, scapo oculum vix attingenti intus ad apicem laminato-producto, funiculi articulis basalibus 2 inter se longitudine sat æqualibus; prothorace quam elytra vix angustiori, antice sat fortiter angustato, quam longiori tertia parte latiori, crebre subtiliter ruguloso, lateribus sat arcuatis; elytris ad basin haud marginatis et quam prothoracis basis haud latioribus, a basi ad apicem (leviter arcuatim) angustatis, punctulato-striatis, puncturis in striis sat sparsim positis, interstitiis latis vix convexis, humeris vix prominulis; tibiis anticis leviter flexuosis; corbulis posticis haud plane apertis.

♀. A mari vix differt nisi elytris ovalibus ad latera magis arcuatis quam prothorax sat latioribus, pedibus anticis paullo brevioribus. [Long. $3\frac{1}{2}$-$4\frac{1}{2}$, lat. $1\frac{1}{2}$-$1\frac{4}{5}$ lines.

This species is a near ally of *P. longipennis*, Pasc., and *satelles*, Blackb. It differs, *inter alia*, from *P. longipennis* by the considerably shorter scape of its antennæ, which is prolonged at the apex (in both sexes) in a kind of lamina, as though it were continued on the inner side beyond the insertion of the base of the 2nd joint (this character is scarcely indicated in the male—not at all in the female—of *P. longipennis*), its rostrum narrower between the antennæ (they being inserted more on the upper surface), the sculpture of the rostrum so fine as to be quite hidden by the scales in a fresh specimen, the finer and closer rugulosity of the prothorax, the absence of a distinct reflexed basal margin of the elytra, &c. From *satelles* also it differs by some of the above characters, and also especially by the basal two joints of its antennæ being of equal length. The suture of its elytra is not carinate behind. The ash-coloured scales of the surface have in some lights a coppery tone, and some of those on the legs and underside are slightly greenish.

It appears to me almost certain that *Oops pistor*, Germ., is a species allied to the present insect, and I incline to think that the description was founded on a small example of *Polyphrades longipennis*, Pasc. In colouring it agrees very well with *P. rostralis*, but is said to have its elytra "margined with a carina at the apex," of which I find no trace in *rostralis*. The apex of the elytra in *longipennis* agrees fairly with Germar's description, and I have seen small brightly coloured examples which do not differ much from the description in other respects.

S. Australia.

POLYPHRADES FULVUS, sp.nov.

♂. Ovalis, sat elongatus; piceus vel niger, squamis obscure fulvis et setis brevibus subclavatis suberectis sat dense vestitus; rostro quam caput paullo longiori, supra 3-carinato; oculis elongato-ovalibus minus subtiliter (quam *P. nitidilabris*, Germ. vix minus fortiter) granulatis; antennis modicis, scapo oculum fere superanti, funiculi articulo basali quam 2^{us}

fere duplo longiori; prothorace quam elytra nullo modo angustiori, antice sat angustato, quam longiori fere tertia parte latiori, sat fortiter sat transversim ruguloso, lateribus sat rotundatis; scutello vix distincto; elytris punctulato-striatis, interstitiis sub squamas leviter convexis, basi minus distincte marginata haud reflexa quam prothoracis basis haud latiori, sutura postice sat convexa nullo modo carinata; corbulis posticis haud plane apertis.

♀. Prothorace quam elytra sat angustiori.

[Long. 3-4$\frac{1}{2}$, lat. 1$\frac{1}{5}$-1$\frac{4}{5}$ lines.

Another member of the *longipennis* group differing *inter alia* from *longipennis* and *rostralis* by the strong transverse rugulosity of its prothorax, from *satelles* by its elytra being devoid of a reflexed basal margin, and from *modestus* by the prothorax of the male fully as wide by measurement (to the eye it appears still wider) as the elytra.

Victoria; Alpine district.

POLYPHRADES MODESTUS, sp.nov.

♂. Sat breviter ovalis; niger, squamis cinereis (in corpore subtus argenteo-tinctis) undique dense vestitus et setis brevissimis suberectis instructus; rostro quam caput vix longiori, supra 3-carinato; oculis elongato-ovalibus sat subtiliter (fere ut *P. longipennis*, Pasc.) granulatis; antennis robustis modice elongatis, scapo oculum medium attingenti, funiculi articulo basali quam 2^{us} dimidia parte (hoc quam 3^{us} haud multo) longiori; prothorace quam elytra angustiori, antice parum angustato, quam longiori sat latiori, minus crebre minus crasse (sub squamas minus distincte) granulatim ruguloso, lateribus leviter arcuatis; scutello vix distincto; elytris punctulato-striatis, interstitiis vix convexis, basi haud marginata quam prothoracis basis vix latiori, sutura postice haud carinata; corbulis posticis haud plane apertis.

♀. Quam ♂ paullo robustiori et latiori; elytris prothoraci proportione latioribus. [Long. 3-3$\frac{1}{2}$ lines.

This species is another member of the *longipennis* group, in all of which I notice the corbels of the hind tibiæ are not quite so simply open as in others of the genus; this is owing to the external face of the tibia being a little gibbous just before the apex, but the margin of the tarsal aperture is not bent inward beyond the general external outline of the tibia as it is when cavernous (in *Leptops*, &c.). This species *inter alia* differs from *P. longipennis* and *satelles* by the absence of a defined basal margin of the elytra, and *inter alia* from *P. rostralis* by the much longer and more slender scape of its antennæ. Owing to its short oval form it has somewhat the facies of *Strophosomus*.

S. Australia; Port Augusta.

POLYPHRADES TIBIALIS, sp.nov.

♂. Elongato-ovalis; piceo-niger, squamis fusco-ferrugineis et setis brevibus erectis plus minusve vestitus; rostro longitudinaliter subtiliter 3-carinato; capite minus crebre punctulato; oculis elongato-ovalibus; funiculi articulo basali 2° 3°que conjunctis longitudine æquali, scapo oculum haud superanti; prothorace quam elytra multo latiori, antice sat fortiter angustato, quam longiori dimidio latiori, ad latera valde rotundato-ampliato, crebre minus crasse (in disco transversim, latera versus magis granulatim) ruguloso; elytris ad basin linea subtili cariniformi marginatis et quam prothoracis basis parum latioribus, mox pone basin angustatis, striatis, striis flexuosis cancellato-punctulatis, interstitiis convexis, humeris extrorsum prominentibus; tibiis anticis flexuosis, intus infra medium late profunde emarginatis et ad apicem valde angulato-dilatatis. [Long. 4, lat. $1\frac{7}{10}$ lines.

This species (at any rate its male) differs from any other of the genus yet described by its extraordinary front tibiæ, which are flexuous externally and on the inner side are scooped out by a deep emargination in nearly the whole of their lower half, but at the apex are suddenly dilated inward into a large triangular process. The great size of the prothorax (by measurement decidedly wider than and more than half as long as the elytra) is also a notable character, and the strongly flexuous striæ of its elytra distinguish it from many of its congeners. The eyes are moderately finely granulated and the elytral suture is not carinate behind.

N. S. Wales; Blue Mountains.

POLYPHRADES FORTIS, sp.nov.

♂. Elongatus; ater (exemplo typico glabro, lateribus dense cinereo-squamosis exceptis); rostro sat fortiter 5-carinato; capite crebre subtilissime punctulato; oculis elongato-ovalibus minus subtiliter (fere ut *P. nitidilabris*, Germ.) granulatis; antennis sat gracilibus modice elongatis, scapo oculi partem posteriorem attingenti, funiculi articulo basali quam 2^{us} fere duplo longiori; prothorace quam elytra vix angustiori, antice fortiter angustato, quam longiori quarta parte latiori, crebre subtilissime punctulato et foveis obscuris elongatis (in disco sparsissime ad latera magis crebre) impresso, lateribus sat arcuatis; scutello minuto; elytris ad basin sat fortiter reflexo-marginatis et quam prothoracis basis vix latioribus, ad angulos anticos extrorsum dentiformibus (latitudine majori ante medium posita), seriatim crasse punctulatis, interstitiis planis (7° juxta apicem sat fortiter carinato excepto); pedibus anticis sat elongatis, horum tibiis leviter flexuosis.

[Long. 7, lat. $2\frac{2}{3}$ lines.

A very *Cherrus*-like species, but with its antennal scape not long enough to reach the back of the eye. The specimen described is entirely glabrous except on the undersurface and on the sides of the prothorax which are thinly sprinkled with cinereous scales, and on the sides of the elytra which bear a wide vitta covering the external three interstices of densely packed cinereous scales. It is possible that the general absence of squamosity is due to abrasion (though I think not), but in any case the species is easily recognisable by its large size, elytra strongly margined at the base with dentiform humeral angles, antennal characters, &c., and the vestiture of a *Polyphrades* ought never to be relied on for a specific character owing to its extremely deciduous nature. The prothorax

until measured looks quite as long as wide. The suture is not cariniform behind.

Victoria.

Polyphrades laminatus, sp.nov.

Ovalis; niger vel fusco-niger vel obscure ferrugineus squamis concoloribus et setis brevissimis suberectis vestitus, et squamis pallidis vel aureis irroratus; rostro quam caput parum longiori (sub squamas leviter 3-carinato), lamina apicali maxima apicem totum ultra antennarum basin tegenti; oculis elongato-ovalibus minus subtiliter (quam *P. nitidilabris*, Germ. fere magis fortiter) granulatis; antennis robustis modice elongatis, scapo oculum medium paullo superanti, funiculi articulo basali quam 2^{us} paullo longiori et crassiori; prothorace quam elytra sat angustiori, antice modice angustato, quam longiori plus quam tertia parte latiori, crebre obscure tuberculato-ruguloso (tuberculis planatis subocellatis), lateribus sat arcuatis; scutello punctiformi; elytris ovalibus, striatis, striis sat fortiter subcancellato-punctulatis, interstitiis planatis, basi vix marginata haud reflexa, quam prothoracis basis vix latiori, sutura postice haud carinata.

♂. Tarsorum anticorum unguiculis fere normalibus, ceterorum valde inæqualibus.

♀. Unguiculis omnibus inæqualibus; elytris paullo magis late ovalibus. [Long. $2\frac{1}{2}$-$3\frac{1}{5}$, lat. 1-$1\frac{2}{5}$ lines.

This remarkable species may be at once known by its peculiar claws [those of the front tarsi being very little different from the ordinary *Polyphrades* type (especially in the male), while on the intermediate tarsi one of the claws is very considerably shorter than the other, and on the hind tarsi one claw is still more diminished in proportion to the other] and by the great size of the apical plate on the rostrum, which occupies the whole surface from the level of the base of the antennæ and extends hindward, more or less narrowing from that point, its front apex being emarginate.

The above characters do not agree satisfactorily with the characters of any hitherto described genus. The species is, however, extremely closely allied to a West Australian insect which has only one claw on each tarsus, and which I take to be *Essolithna pluviata*, Pasc. But the examples now before me can hardly be referred to *Essolithna*, of which its author says, "the one-clawed tarsi is the most trenchant character of this genus, which in habit (sic) closely resembles *Polyphrades*," nor, I am quite confident, can it be rightly separated generically from the species mentioned above as having one-clawed tarsi. Hence I conclude that *Essolithna* must either be regarded as inseparable from *Polyphrades* or re-characterised. I should not be justified in re-characterising it without seeing a type named by its author, and therefore must fall back on referring to *Polyphrades* (in the Lacordairean sense) this present species, at the same time feeling little doubt that its proper place is beside the species which Pascoe called *Essolithna pluviata* and that which I have named *E. seriata* (Trans. Roy. Soc. S.A. xvi., p. 50) in spite of their tarsi having only one claw. This species is very different from *Esmelina*, Pasc., by its rostral lamina, &c., although resembling it by its unequal claws.

S. Australia; Eyre's and York's Peninsulas.

POLYPHRADES PICTUS, sp.nov.

Ovalis; niger; squamis fuscis cinereis et cupreis intermixtis et setis brevissimis clavatis suberectis dense vestita, antennis pedibusque fuscis, his cinereo-variegatis; rostro quam caput vix longiori, supra 3-carinato, ad basin transversim sulcato; oculis elongato-ovalibus minus subtiliter (fere ut *P. nitidilabris*, Germ.) granulatis; antennis robustis modice elongatis, scapo oculum fere superanti, funiculi articulo basali quam 2^{us} sat longiori et crassiori; prothorace antice minus angustato, fere ut *P. laminati* sculpturato, lateribus sat arcuatis; scutello punctiformi; elytris ovalibus, punctulato-striatis, interstitiis sub squamas sat convexis, basi subtiliter marginata haud reflexa, quam prothoracis basis vix latiori, sutura postice haud carinata.

♂. Prothorace quam longiori vix latiori quam elytra vix angustiori.

♀. Prothorace quam longiori sat latiori, quam elytra sat angustiori. [Long. $2\frac{1}{2}$-$3\frac{1}{2}$, lat. 1-$1\frac{2}{5}$ lines.

This species is a typical *Polyphrades* nearest perhaps to *P. nitidilabris*, Germ., but very different from it. It is exceptionally prettily marked among its usually dull-coloured congeners. A well-marked example has the head mottled with fuscous and whitish, the prothorax with fuscous and coppery, the elytra with fuscous-coppery and cinereous, the underside with fuscous and coppery, and the legs with fuscous and whitish scales. On the elytra, regarding fuscous as the groundcolour, the cinereous scales form a few small irregularly placed spots, and the coppery scales run in irregular lines down the interstices, that on the suture being the most continuous and conspicuous.

S. Australia; Eyre's Peninsula; on *Casuarina*.

POLYPHRADES INCONSPICUUS, sp.nov.

♂. Ovalis; minus latus; fuscus vel piceus, squamis albidis (supra aliis fuscis plus minusve crebre intermixtis) et setis brevissimis suberectis dense vestitus, nonnullorum exemplorum tibiis tarsisque plus minusve rufescentibus; rostro quam caput vix longiori, supra sub squamas 3-carinato, ad basin leviter (fere ut *P. nitidilabris*) transversim impresso; oculis ovalibus depressis subtiliter granulatis (quam *P. nitidilabris* magis depressis magis subtiliter granulatis); antennis modicis, scapo oculi marginem posticum attingenti, funiculi articulo basali quam 2^{us} crassiori et sesquilongiori; prothorace quam elytra tertia parte angustiori, antice vix angustato, quam longiori fere dimidia parte latiori, modice punctulato-ruguloso (haud multo aliter quam *P. nitidilabris*), lateribus sat rotundatis; scutello fere nullo; elytris punctulato striatis, interstitiis sat planis, basi haud marginata quam prothoracis basis vix latiori, sutura paullo convexa, sed haud distincte carinata.

♀. Elytris magis late ovalibus. [Long. $1\frac{3}{5}$-2, lat. $\frac{7}{10}$-$\frac{9}{10}$ line.

This little species is more distinctly marked with a pattern than is usual in the genus. In a fresh bright example the underside is densely clothed with white scales, and the upper surface is mottled with fuscous and whitish scales in almost equal proportions, so distributed, however, that the head and rostrum and the sides of the prothorax and elytra are almost white, that the colours run in somewhat indistinct vittæ on the disc of the prothorax, and that there is a short more or less distinct white vitta on either side of the scutellum, while the femora are ringed with white, the white scales being apparently the first to disappear under abrasion. Specimens in inferior preservation have few of the white markings.

Victoria; sent by Mr. French.

POLYPHRADES PERPLEXUS, sp.nov.

♂. Breviter ovalis; piceus, tibiis rufescentibus; squamis fulvis albidisque intermixtis vestitus; rostro a capite vix distincto, quam caput vix longiori, latissimo, quam latiori vix longiori, planato, sub squamas in medio carinato, lamina nitida apicali parva minus distincta; oculis ovalibus sat subtiliter (quam *P. nitidilabris* magis subtiliter) granulatis, depressis; antennis modicis, scapo oculi marginem posticum attingenti, funiculi articulo basali brevi quam 2^{us} (et hoc quam 3^{us}) parum longiori; prothorace quam elytra horum quinta parte angustiori, antice parum angustato, quam longiori tertia parte latiori, sub squamas sat sparsim minus fortiter vix rugulose punctulato, lateribus sat arcuatis; scutello minuto; elytris sat fortiter (sub squamas minus perspicue) punctulato-striatis, interstitiis sat planis, basi haud marginata quam prothoracis basis haud latiori, sutura haud carinata.

♀. Latet. [Long. 2, lat. 1 line.

The short oval form and very wide rostrum not very distinct from the head and with its apical plate small and little conspicuous are characters that in combination distinguish this species very readily. The scales on my example are a little rubbed, so that I cannot describe their arrangement very exactly; but I can say that the fulvous scales are the prevalent ones and that the whitish scales are condensed on the sides of the prothorax and elytra.

S. Australia; Eyre's Peninsula.

POLYPHRADES LÆTUS, sp.nov.

♂. Sat breviter ovalis; piceus, antennis tarsisque rufescentibus; squamis fuscis albidisque (his in exemplis recentibus fere plumbeis vel etiam pallide viridibus) intermixtis vestitus; rostro a capite sat distincto, quam caput vix longiori, supra 3-carinato, lamina apicali sat magna; oculis ovalibus minus subtiliter (fere ut *P. nitidilabris)* granulatis, sat depressis; antennis modicis, scapo oculum paullo superanti, funiculi articulo basali quam 2^{us} fere duplo (hoc quam 3^{us} haud multo) longiori; prothorace quam elytra sat angustiori, antice sat angustato, quam longiori tertia parte latiori, sub squamas crasse ruguloso, lateribus sat rotundatis; scutello minuto; elytris punctulato-striatis, interstitiis sat latis sat planis, basi haud marginata quam prothoracis basis vix latiori, sutura leviter convexa nullo modo carinata.

♀. Elytris magis late ovalibus. [Long. $1\frac{1}{2}$-$1\frac{3}{5}$, lat. $\frac{3}{4}$ line.

The principal characters of this species are—form short, oval, antennal scape reaching back a little beyond the eye (nearly to the prothorax), upper surface with more attractive markings than is usual in the genus, antennæ and tarsi of a bright ferruginous tone. In a well-marked specimen the prevailing scales are those of a whitish colour, with a pale green (not at all metallic) or leaden tint, and the fuscous scales form the following markings (which, however, are by no means sharply defined)—two large blotches on the vertex, two vittæ on the disc of the prothorax, a very suffused and irregular space on each elytron occupying the greater part of the 2nd and 3rd interstices. I have submitted an example of this insect to Mr. Pascoe, who returned it as unknown to him.

S. Australia; Eyre's Peninsula.

The following table exhibits some of the distinctive characters of the species described above. For the sake of comparison I have included a few previously described species.

- A. Hind corbels subcavernous.
  - B. Basal joint of funiculus longer than 2nd.
    - C. Prothorax more or less closely rugulose.
      - D. Elytra margined at base.
        - E. Elytra at apex margined with a carina........................ *longipennis*, Pasc.
        - EE. Elytra at apex normal....... *satelles*, Blackb.
      - DD. Elytra not margined at base.
        - E. Pubescence bright fulvous..... *fulvus*, Blackb.
        - EE. Pubescence whitish........... *modestus*, Blackb.
    - CC. Prothorax (saving a few remotely and irregularly placed rugulosities) smooth........................ *fortis*, Blackb.
  - BB. Basal two joints of funiculus equal *inter se*................................ *rostralis*, Blackb.
- AA. Hind corbels normal.
  - B. Apical plate of rostrum normal.
    - C. Head not or scarcely strigose longitudinally.
      - D. Rostrum well distinguished from head.
        - E. Size not very small (not less than long. 3 lines, rostr. incl.).
          - F. Basal joint of funiculus more than three times as long as wide................ *tibialis*, Blackb.
          - FF. Basal joint of funiculus about twice as long as wide....................... *nitidilabris*, Germ.

EE. Size very small (long. 2 lines or less).
- F. Antennæ entirely bright ferruginous in colour...... *lœtus*, Blackb.
- FF. Antennæ of much darker colour..................... *inconspicuus*, Blackb.

DD. Rostrum continuous with head, its apical plate little developed.
- E. Basal joint of funiculus more than twice as long as wide *tumidulus*, Blackb.
- EE. Basal joint of funiculus much less than twice as long as wide........................ *perplexus*, Blackb.

CC. Head very conspicuously strigose longitudinally.
- D. Elytra bearing a very conspicuous large white spot......... *biplagiatus*, Pasc.
- DD. Elytra without conspicuous white markings......... ..... *pictus*, Blackb.

BB. Apical plate of rostrum very large *laminatus*, Blackb.

(ERIRHININÆ.)

RHACHIODES SIMPLEX, sp.nov.

Brevis: latus; *Erytennœ* forma haud multo dissimilis; piceus, supra squamis testaceo-brunneis et nonnullis fuscis (his varie indeterminate intermixtis) densissime vestitus; subtus dense albido-squamosus; rostro quam prothorax sat longiori, sat cylindrico, leviter arcuato, punctulato; capite prothoraceque sparsim punctulatis (puncturis maculas minutas nigras inter squamas simulantibus); hoc vix transverso supra æquali antice leviter constricto; scutello minuto albido; elytris punctulato-striatis (puncturis sat magnis sat remote positis), interstitiis vix convexis, 2° ante medium 4° pone medium tuberculo nigro sat magno ornatis, humeris fere ut *R. bicaudati*, Boisd., sed antrorsum magis productis.

[Long. (rostr. excl.) 2, lat. 1$\frac{1}{5}$ lines.

This species must I think be referred to *Rhachiodes* (in spite of a considerable difference between its outline and that of most of the previously described members of the genus) on account of the following structural characters : Antennal funicle 7-jointed, scape not quite reaching eye, scrobes straight (median or slightly antemedian), eyes finely facetted, ocular lobes of prothorax distinct, elytra tuberculate, ventral segment 2 longer than 3 and 4 together, femora unarmed, tibiæ mucronate at apex, tarsi wide and comparatively short, their claw joint projecting not much beyond the lobes of the 3rd joint. I should judge that it is structurally near *R. signaticollis*, Chev., and *nigropunctatus*, Chev., which their author seems to regard as forming a distinct section of *Rhachiodes*.

The peculiar tuberculation of the elytra renders this insect very easily recognisable, each elytron having no inequalities except the humeral callus and two small but very conspicuous black tubercles, one (the larger of the two) on the 2nd interstice at or slightly in front of its middle, the other on the 4th interstice a little nearer to the apex. The general squamosity, which is very dense, is of a pale testaceous-brown colour, variably clouded with a darker shade. The 2nd joint of the funiculus is considerably shorter than the first and not much longer than the 3rd.

S. Australia.

BAGOUS AUSTRALASIÆ, sp.nov.

Piceus, squamis griseo-albidis vestitus, in elytrorum utroque macula albida transversa paullo pone medium posita, pedibus antennisque (harum apice infuscato) rufescentibus; rostro quam prothorax (maris sat manifeste feminæ vix) breviori; prothorace pone apicem sat fortiter constricto, leviter canaliculato; elytris fortiter striatis, interstitiis subconvexis.

[Long. 1$\frac{3}{5}$, lat. $\frac{7}{10}$ line.

Seems to be a typical *Bagous*,—a genus not previously reported from Australia. Coloured very much like *B. inceratus*, Gyll., but with a whitish spot on each elytron placed almost as in *Hydronomus alismatis*, Marsh. The shape of the prothorax is almost as in *B. inceratus*, but its sides are less rounded and the constriction is further from the front margin. The sculpture of the elytra is almost exactly as in *B. subcarinatus*, Gyll., except that the striæ are less distinctly punctured, but their outline is as in *B. inceratus*.

S. Australia; Murray Bridge; in marshy places on the banks of the Murray.

BAGOUS ADELAIDÆ, sp.nov.

Piceo-niger, pube subtilissima dilutiori et setulis brevibus albidis sparsim (? exemplo typico abraso) vestitus, pedibus antennis (harum parte apicali excepta) et rostri apice rufescentibus; rostro (exempli typici) quam prothorax sat breviori subtilissime punctulato; capite subtiliter ruguloso inter oculos profunde sulcato; prothorace crebre subtilius punctulato vix transverso pone apicem sat fortiter constricto, late leviter canaliculato; elytris subtilissime rugulosis, punctulato-striatis, interstitiis convexis (alternis quam cetera magis fortiter); prosterno ante coxas profunde excavato; corpore subtus crebre leviter punctulato; segmento ventrali basali antice late rotundato. [Long. 2, lat. $\frac{4}{5}$ line.

The deep excavation (with strongly elevated sides) of the prosternum and the rounded intercoxal process of the abdomen are noticeable characters of this insect. The anterior four tibiæ are denticulate within.

S. Australia. In flood refuse of the Torrens.

(ATTELABINÆ.)

EUOPS VICTORIENSIS.

Sat brevis; nitida; nigra, vix ænescens; oculis haud contiguis; capite prothoraceque minus fortiter minus crebre punctulatis; elytris sat fortiter (apicem versus obsolete) punctulato-striatis, interstitiis latis sat planis; pygidio sat grosse sat crebre punctulato. [Long. $1\frac{1}{3}$-$1\frac{1}{2}$, lat. $\frac{3}{5}$-$\frac{7}{10}$ line.

The entirely uniform black colour of this species distinguishes it at once from all its described Australian congeners.

Victoria; Alpine district.

LONGICORNES.

MONOHAMMUS FRENCHI, Blackb.

Mr. French has recently presented me with an example of *Monohammus* from the McDonnell Ranges which is evidently the male of this species. It is considerably smaller than its female (long. 8 lines) and bears considerable resemblance to *M. ovinus*, Pasc., but differs from it by its elytra less narrowed from the base hindward and truncate at their apex, and by its antennæ having their basal joints scarcely dilated.

DESCRIPTIONS OF SOME NEW ARANEIDÆ OF NEW SOUTH WALES. No. 3.

By W. J. Rainbow.

(Plate x.)

The present paper contains descriptions of four species of spiders new to science, for which I am indebted to Mr. A. M. Lea, whose name I have much pleasure in connecting with one of them *(Epëira Leai)*. I desire herewith to place on record my gratitude to that gentleman for the valuable assistance he has rendered me in connection with my investigations into the Araneidan-fauna of New South Wales, by collecting numerous specimens from a wide range of localities.

The most interesting, varied, and striking forms are found amongst the pygmies rather than the larger representatives of this order, and it is owing to his care in procuring so many specimens of *Micro-Araneidæ* that the collections made by Mr. Lea are so valuable.

Family EPEIRIDÆ.

Genus Epeira, Walck.

Epeira Leai, sp.nov.

(Plate x. fig. 1.)

♀. Cephalothorax, 3 mm. long, 2 mm. broad; abdomen, 5 mm. long, 3 mm. broad.

Cephalothorax yellow-brown, sparingly hairy. *Caput* truncated in front, elevated and rounded on the sides, normal grooves distinct. *Clypeus* convex, yellow-brown, with faint lateral striations and a few short hoary hairs. *Marginal band* narrow, dark brown, fringed with minute dark hairs.

Eyes jet-black; the four comprising the central group forming a square or nearly so, the posterior pair largest of the eight; the lateral pairs placed obliquely on tubercles, not contiguous.

Legs yellow-brown, with dark annulations at joints, long, strong, furnished with moderately long yellowish hairs and short strong spines; relative lengths, 1, 2, 4, 3; second and third pairs equal; each *tarsus* terminated with four claws, the three superior ones much the longest and strongest, pectinated near their base on the underside; in addition to these each posterior leg has a strong movable spine *(sustentacula)* inserted near the termination of the tarsus.

Palpi moderately long, somewhat paler than the legs, furnished with long coarse hairs, and each terminated by a rather long and strong pectinated claw.

Falces yellowish at base, but darker towards extremities, vertical, armed with teeth along the margin on the underside.

Maxillæ pale yellow, short, strong and rounded at extremity, furnished with a few short strong black hairs.

Labium somewhat darker than maxillæ, short, semicircular, but slightly pointed at apex.

Sternum dark mahogany-brown, cordate, sparingly clothed with short sessile hairs.

Abdomen ovate, moderately convex and slightly projecting over base of cephalothorax; superior surface sparingly clothed with short yellowish hairs; palish yellow, a large leaf-like brown mark with sinuous lateral edges extending along the middle and tapering towards the spinnerets; within the leaf-like mark the colour is mottled brown and yellow, but is darkest at the posterior extremity; there is also a dark brown mark, which is broadest and sinuous towards its anterior extremity, running down the centre of the leaf-like mark towards the spinnerets; the sides are dark brown near the superior surface, and the margins sinuous; towards the inferior surface the sides are mottled brown and yellow; underside hairy; dull brown colour along the middle, yellowish at sides.

Epigyne a short blunt process.

Hab.—Bungendore.

EPEIRA PRONUBA, sp.nov.

(Plate x. figs. 2, 2*a*, 2*b*, 2*c*, 2*d*.)

♀. Cephalothorax, 2 mm. long; abdomen, 3 mm. long, 2 mm. broad.

Cephalothorax pale yellow, moderately convex, longer than broad. *Caput* slightly elevated, somewhat darker at base than at apex, rounded on the sides and upper part; normal grooves and indentations distinct. *Clypeus* moderately convex, pale yellow, with faint lateral striations radiating from near centre. *Marginal band* narrow and rather darker than clypeus.

Eyes glossy black; the four comprising the central group forming a square or nearly so; lateral pairs minute, placed obliquely on tubercles, and not contiguous.

Legs pale yellow, slightly darkest at tarsal joints, long, moderately strong, and tapering, furnished with short hairs and numerous long spines; each *tarsus* terminated with four claws, those of the posterior pair with *sustentacula;* relative length of legs, 1, 2, 4, 3; those of the first pair the longest, the second and fourth pairs of equal length, the third pair much the shortest.

Palpi moderately long, similar in colour and armature to the legs.

Falces strong, pale yellow, furnished with a few long black bristles and armed with teeth along the margins of the furrow of each falx; *fangs* pale yellow also, but deepening to reddish-brown at the points.

Maxillæ somewhat club-shaped, pale yellow, inclining inwards towards labium, furnished with a few rather long yellowish bristles.

Labium also pale yellow, short, broad, rounded off at apex, where it is fringed with coarse black hairs or bristles.

Sternum cordate, pale yellow, sparingly clothed with short sessile hairs.

Abdomen obovate, moderately convex, slightly projecting over base of cephalothorax; superior surface silvery-grey, mottled with yellowish-brown and furnished with minute hoary hairs; a small but tolerably prominent yellow-brown mark towards the anterior extremity and seated at the centre. The inferior surface of a dull yellow colour.

Epigyne a short blunt dark process directed forwards.

Hab.—Bungendore.

Family THERIDIIDÆ.

The spiders of this family are exceedingly interesting, and many of them are remarkable for their brilliancy of coloration, in which respect the specimen herein described (*Theridion margaritarium*, which I so name on account of the strong resemblance of the superior surface of its abdomen to mother-of-pearl) is a striking example. Bush and scrub lands, orchards, gardens, the crevices of walls and rocks, and the interior of buildings are the situations in which the *Theridiidæ* most abound. Their snares have no claim to architectural skill, but are constructed without any apparent plan or design, and are composed of very fine lines which cross and interlace each other from every conceivable angle or point.

Genus THERIDION, Walck.

THERIDION MARGARITARIUM, sp.nov.

(Plate x. figs. 3, 3*a*, 3*b*, 3*c*.)

♀. Cephalothorax, 2 mm. long, 1·5 mm. broad; abdomen, 4 mm. long, 1 mm. broad.

Cephalothorax pale yellow, moderately convex. *Caput* elevated, rounded on the sides and upper part, compressed in front, tinged with red at base. *Clypeus* pale yellow, convex, with a deep longitudinal groove running its entire length, the edges of which are slightly tinged with red; a few short white hairs are distributed over its surface. *Marginal band* narrow, tinged with red, and sparingly fringed with short white hairs.

Eyes of pearl-grey lustre with a black band; the four centrals the largest of the group, forming a square; the posterior pair separated from the front pair by a space equal to the diameter of one eye, each of them separated from the other on its side by an equal distance; the lateral eyes the smallest of the group, placed in pairs contiguous to each other, obliquely on tubercles.

Legs long, pale yellowish; the *trochanter*, *femur*, and *tibia* of each leg of the first, second, and third pairs with faint reddish annulations, but of those of the fourth pair the *femur* and *tibia* alone are so banded; there are also dark red annulations at the joints of each leg; all are furnished with short whitish hairs and spines, the hairs being the longest and strongest on the underside of the *metatarsi* and *tarsi;* each *tarsus* terminated with four claws; relative length of legs, 1, 4, 2, 3, the first and fourth pairs equal, the second slightly shorter, and the third much so.

Palpi pale yellowish, short, and similar in armature to the legs; each terminated with a rather long curved red claw.

Falces concolorous, vertical, moderately strong, furnished with a few short blackish hairs; fangs red.

Maxillæ and *labium* pale yellowish; the former short, broad at the apex, inclined inwards, and furnished with a few short dark hairs. *Labium* short, broad, rounded off at the apex, and fringed with dark hairs.

Sternum cordate, pale yellow, sparingly clothed with short yellowish hairs.

Abdomen obovate, convex, slightly projecting over base of cephalothorax; bright and iridescent like mother-of-pearl; a large greyish patch in centre of superior surface, in front of which is a curved band of rose-tinted colour, the curvature directed backwards and laterally; at the posterior portion there are two small elevations, each of them taking a slightly outward direction; their margins rose-tinted; the superior surface and sides indented with numerous though somewhat irregular hexagonal depressions or cells, the depths of which are of a pearl lustre, and their margins tinged with red; a few short hoary hairs are scattered over the superior surface and sides. Inferior surface pale yellow, furnished with short yellowish hairs.

Epigyne reddish-brown, broad, anterior margin curved, lower margin indented at middle.

Hab.—Clarence River.

Family THOMISIDÆ.

Sub-Family STEPHANOPISIDÆ.

Genus STEPHANOPIS, Cambr.

STEPHANOPIS HIRSUTA, sp.nov.

(Plate x. figs. 4, 4*a*, 4*b*, 4*c*, 4*d*, 4*e*, 4*f*.)

♀. Cephalothorax, 4 mm. long; abdomen 6 mm. long.

Cephalothorax nearly as broad as long, somewhat convex. *Caput* elevated, sloping forward, deeply cleft, with a shallow indentation commencing in front, separating the two central eyes, running to the base of the cephalic eminence, besides which there are also several tubercles scattered over its surface; colour yellow-brown, the tubercles dark, approaching bistre. *Clypeus* yellow-brown, the tubercles similar in colour to those seated on the cephalic eminence, and radiating from the centre to the marginal band; its surface clothed with short coarse yellow-brown hairs. *Marginal band* narrow, fringed with tawny hairs.

Eyes forming a ring or corona around the upper part of the cephalic eminence, four of them being seated at the back in a slightly curved row—the curvature being directed downwards towards the sides; these are equal in size, equidistant, each being separated from its neighbour by a distance subequal to its diameter; front lateral eyes somewhat larger than those of the hinder row, and separated from each other by fully the diameter of two eyes; front central eyes much the smallest of the eight, seated lower down the cephalic eminence than the laterals, but each central eye situated nearer to the lateral eye than to each other.

Legs laterigrade, strong, moderately long, similar in colour to cephalothorax, clothed with short coarse tawny hairs; the *trochanter* and *femur* of each leg of the first and second pairs furnished on the upper side with long and strong tubercles, which are directed forwards and densely clothed with short tawny hairs, and on the under side with short but powerful spines which lie parallel to the joint on which they are located; the *tibia*, *metatarsus*, and *tarsus* of those legs are furnished with much longer hairs and spines than the second and third joints, but are not furnished with tubercles; the third and fourth pairs somewhat lighter in colour than the first and second, their tubercles and spines not so strong and prominent as those of the anterior pairs; the hairs of each metatarsus and tarsus darkest on the under side; relative length of legs, 1, 2, 4, 3, the first and second pairs co-equal, or nearly so, and much the strongest.

Palpi short, strong, and similar in colour and armature to the legs.

Falces strong, and moderately long, yellow-brown, furnished with rather long coarse black hairs or bristles; *fangs* black.

Maxillæ dark brown, moderately long, converging inwards, fringed with coarse black hairs.

Labium concolorous, moderately long, broad, rounded off at apex; fringed with coarse black hairs.

Sternum nearly round, yellow-brown, thickly clothed with short tawny hairs.

Abdomen obovate, slightly projecting over the base of the cephalothorax, somewhat truncate in front, and slightly notched; superior surface thickly clothed with short tawny hairs, rough and uneven, furnished along the sides with short tubercles; hinder part higher and broader than the fore extremity, strongly rugulose, and furnished with short tubercles; the colour yellow-brown, but darkest in front and down the centre; sides yellow-brown, rugulose; inferior surface rugulose, yellow-brown, and thickly clothed with short dark hairs.

Epigyne slightly raised, somewhat circular in form, depressed in the middle.

Hab.—Clarence River.

EXPLANATION OF PLATE X.

g. 1. —*Epëira Leai.*
Fig. 2. —*E. pronuba.*
Fig. 2*a.*— ,, profile of abdomen.
Fig. 2*b.*— ,, maxillæ and lip.
Fig. 2*c.*— ,, tarsus.
Fig. 2*d.*— ,, epigyne, in profile.

Fig. 3. —*Theridion margaritarium.*
Fig. 3*a.*— ,, ,, sternum, maxillæ, labium, and coxæ.
Fig. 3*b.*— ,, ,, epigyne.
Fig. 3*c.*— ,, ,, eyes.

Fig. 4. —*Stephanopis hirsuta.*
Fig. 4*a.*— ,, ,, caput as viewed from the back, showing arrangement of 2nd row of eyes.
Fig. 4*b.*—*Stephanopis hirsuta,* caput as viewed from the front, showing arrangement of 1st row of eyes.
Fig. 4*c.*—*Stephanopis hirsuta,* cephalothorax and palpi as viewed behind and above.
Fig. 4*d.*—*Stephanopis hirsuta,* sternum, maxillæ, labium, and coxæ.
Fig. 4*e.*— ,, ,, tibia, metatarsus, and tarsus of front right leg.
Fig. 4*f.*—*Stephanopis hirsuta,* epigyne.

NOTES ON AUSTRALIAN ABORIGINAL STONE WEAPONS AND IMPLEMENTS.

By R. Etheridge, Junr.

(Palæontologist to the Australian Museum, and Geological Survey of N. S. Wales.)

(Plates xi.-xiii.)

xviii.—*Tomahawks with Hafting Grooves.**

Grooved tomahawks are far less common, than those unprovided with this adjunct to fastening a handle, in collections of Australian stone weapons and implements, and it is inferred that the manufacture of them by the Blacks was equally so.

I have already figured† a fairly good example from North Queensland, and referred to other figures extant. The first of the two specimens now described is from Gorman's Hill West, Lake Cudgellico, Co. Dowling, and for an opportunity of noticing it, I am indebted to Mr. G. A. Stonier, of the Geological Survey of N. S. Wales, who obtained it at that place.

This example of the grooved tomahawk differs from that already figured in these Notes in having the hafting groove far back towards the butt. On the other hand, it agrees in this feature with one figured by Smyth,‡ although the outline of the two weapons is different. The present implement is particularly well finished, with a strong hammer-headed butt, probably used for crushing, this appearance being intensified by the posterior position of the groove. Like the grooved tomahawk from North Queensland, the shape of the present example is ovate, convex on one face and somewhat flattened on the other, especially towards the anterior. The cutting edge is much more regularly curved than in the generality of tomahawks, but the bevelled sides are unequal in consequence of the almost plano-convex section of the pebble from which the implement has been adapted. The hafting groove is wide, and rather less than two-eighths of an inch deep; it has been very regularly and equally prepared. The general surface exhibits a roughened more or less areolate structure, probably the result of weathering, the immediate cutting-edge being the only smoothed part. The latter is slightly chipped, and the surface of the hammer-headed butt indented or bruised. The longest diameter of the head is two and three-eighths inches, and the shortest one and four-eighths inches. The tomahawk is four and five-eighths inches long and three inches wide. Its weight is one pound three ounces. In colour it is brownish-black. Impossible as it is to spoil the implement by the preparation of a microscopic section, its petrological identity can only be surmised from macroscopic examination. The rock is regarded by Mr. G. W. Card as a finely crystalline igneous rock, possibly a diorite or diabase. Like the grooved tomahawk figured by the late Mr. McPherson, our specimen differs from the North Queensland example in the much more posterior position of the hafting groove, and thereby approximates to the implement figured by Smyth from a *Mirrn-yong* at Lake Condah, Victoria, but the butt end in the present one is much flatter.

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* I am indebted to Mr. G. W. Card, Mineralogist to the Dept. of Mines, for determining the petrological characters of the present weapons.

† P.L.S.N.S.W. 1891, vi. (2), p. 367, t. 31, f. 3 and 4.

‡ Aborigines of Victoria, 1878, i. p. 368, f. 183, p. 372, f. 195.

A very heavy grooved implement from Cape Hawke, N. S. Wales, is in the Australian Museum, presented by Mr. Hugh Breckenridge, and is again converted from a large pebble, also a finely crystalline igneous rock, probably a diabase, says Mr. Card. It is much heavier than either of the previous examples that have come under my notice, weighing three pounds. The hafting groove is not nearly so posterior in position as in that just described, or in the Queensland Museum specimen. It is also shallower and wider. The bevel has been produced, as usual, by grinding the surface rather more on one face than the other. The cutting-edge is well curved, and was before injury approaching the semicircular. In this instance we find that the butt-end, which is convexly truncated, has been partially shaped by grinding.

The Cape Hawke tomahawk is a heavy and unwieldy implement, and when in use must have been mounted on an extremely strong handle, or perhaps simply held by a slender withy and used as a wedge. The acceptance of the latter view would no doubt account for the bruised appearance presented by the butt-end. The tomahawk is five and six-eighths inches long, three and seven-eighths broad, and two and a half inches in thickness.

So far, therefore, as our present knowledge of these grooved tomahawks stands, we have two types—

1. *Ovate type.*
    - *a.* With the hafting groove more or less central.
    - *b.* With the hafting groove posterior.
2. *Deltoid type.*
    - *b.* With the hafting groove posterior.

The recorded distribution is now as follows:—

1. North Queensland *(De Vis).*
2. Tilligerry Creek, Port Stephens, N.S.W. *(McPherson).*
3. Cape Hawke, N.S.W. *(Breckenridge).*
4. Lake Cudgellico, Co. Dowling, N.S.W. *(Stonier).*
5. Lake Condah, Co. Normanby, Vict. *(Smyth),* where they are known as *Pur-ut-three.*

XIX.—*Tomahawk of the Gad-shaped Type.*

A very fine example of what I have termed the "Gad-shaped" type has been presented to the Mining and Geological Museum by Mr. W. A. Cuneo, of Thirlmere, where it was found. It consists of an oblong pebble, either diorite or diabase, Mr. Card thinks, decreasing in diameter towards the butt. The longer edges in the anterior or fore part of the tomahawk are practically parallel, one of the sides moderately convex, the other flattened in the middle. The cutting-edge is regularly curved and the bevel almost equal on both faces, with the striæ resulting from the grinding still visible, passing diagonally across the faces.

Towards the butt the sides rapidly attenuate to a suitable circumference to render the implement of a fit size to be held in the hand; and there is the possibility, therefore, of the members of this group having been so used, although I did not suggest this in a former paper when dealing with similar tomahawks. The butt-end is rounded and shows traces of abrasion and chipping. The length of this remarkably fine implement is eight and a half inches, the breadth two and five-eighths, greatest thickness one and three-eighths inches, and the weight one pound fifteen ounces. The surface is roughened by weathering.

XX.—*Toy Tomahawk.*

I am indebted to the Rev. J. M. Curran for a very extraordinary little implement. It is from the west, probably the Bogan country, and consists of a greenish-coloured rock agreeing in hardness and specific gravity with serpentine, according to Mr. G. W. Card. It is a flake and not a pebble, thickest at the anterior end and thinning off to a mere nothing at the butt. The cutting edge is only very slightly curved, whilst the bevel is remarkably short and abrupt on each face, bounded posteriorly by sharp ridges, instead of graduating insensibly into the body of the implement.

The dimensions of this little toy are—Length one and a half inches, breadth one and one-eighth inches, thickness seven-sixteenths of an inch, and weight three-quarters of an ounce. It is difficult to conceive that this little implement could have been put to any utilitarian purpose, and I can only regard it, with the present knowledge I possess of Aboriginal stone implements, as a picanniny's tomahawk. We know that amongst the Aborigines the children were provided with miniature weapons and implements, as a part of juvenile instruction. Mr. Smyth remarked*: "The toy weapons which are made for the use and amusement of the children, the care that is taken in teaching the boys to throw the spear, to use the stone tomahawk, the shield, and the club . . . . make them when even young quite accomplished bushmen."

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* Aborigines of Victoria, 1878, i. p. 49.

Note.—A second child's tomahawk has been lent me by Mr. J. H. Maiden, from the Goulburn Technological Museum. It was found at Cowal, Forbes District, and is even smaller than that from the Bogan. Like the latter, it is a flake instead of a pebble. Mr. G. W. Card says—"it has all the appearance of being a fragment of lydian stone—the 'touchstone' of jewellers." The little specimen is one and a quarter inches long and three-quarters of an inch wide. The weight is about half an ounce.

EXPLANATION OF FIGURES.

Plate xi.

Fig. 1.—Tomahawk with hafting groove (side view); Cape Hawke.
Fig. 2.—The same (edge view).

Plate xii.

Fig. 1.—Tomahawk with hafting groove (edge view); Lake Cudgellico.
Fig. 2.—Gad-shaped tomahawk (edge view); Thirlmere.

Plate xiii.

Fig. 1.—Tomahawk with hafting groove (side view); Lake Cudgellico.
Fig. 2.—Gad-shaped tomahawk (side view); Thirlmere.

THREE ADDITIONAL TYPES OF WOMERAH OR "THROWING-STICK."

By R. Etheridge, Junr.

(Palæontologist to the Australian Museum, and Geological Survey of N. S. Wales.)

(Plate xiv.)

I am indebted to Mr. Harry Stockdale for an opportunity of describing three types of Womerah, additions to those already figured in the Proceedings of this Society.

It will be remembered that I described a rigid lath-like weapon from Agate Creek, a tributary of the Gilbert River, north-eastern Australia,* devoid of any transversely flattened surface for a spear rest. At the hinder end of this womerah was mounted the usual spear-peg, and at the fore end two pieces of *Melo* shell adpressed together.

The first of the three weapons now to be described corresponds in shape, thickness, rigidity, and position of the spear-peg with the Agate Creek throwing-stick, but in place of the pieces of adpressed shell at the proximal end is another peg, formed of two pieces of flattened wood, one placed on either side of the stick, and held in position against its sides by black gum-cement. At the hinder end there is only just sufficient cement to hold the spear-peg in its place, but the fore or proximal end of the weapon has been wrapped round with some kind of fabric and the cement smeared over its surface for a space of four inches, as well as enveloping the additional double peg. The surface of the cement and fabric is much roughened, as if some other foreign body had been wrenched off. It may be that the surface of the gum-cement has merely peeled off or been removed by fracture, or, on the other hand, there is the possibility that portions of shell were attached at this end also, in addition to the double peg. Whichever it may have been, the presence of the latter indicates at least a varietal departure from the lath-like weapon of Agate Creek already described. In the absence of the native name of this weapon it may be known as the "Fore and Aft Womerah."

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* P.L.S.N.S.W. 1891, v. (2), p. 701.

The length of this womerah is three feet one inch, the width at the centre two inches, and at either end one and three-eighths inches, showing a slight degree of taper towards the extremities. The wood is extremely close, hard, and dark-coloured. Several indentations and chippings of the upper edge show this to be an old weapon that has seen good service in the hands of its sable possessor.

The second type is much shorter, thicker, and slightly curved. The proximal or fore end is simply rounded off, and is a good deal hand-stained from frequent use. The spear-peg at the distal termination is long, very obliquely set, and held in position by twine, or even perhaps sinews, and a very coarse kind of gum-cement. The length of this womerah is two feet one and a half inches long across the curve, with a uniform width of one and two-eighths inches, except at the proximal end, where it broadens somewhat, and becomes at the distal end flat, top and bottom, apparently to give a good abutment for the spear-peg. This womerah is very handy and must have been effective, giving one the idea of a much more serviceable and powerful weapon than those previously described.

The late R. Brough Smyth figures* a number of womerahs with blunt or semi-rounded proximal ends, but they are all broad-bladed weapons. One,† however, is more akin to that now under description; at the same time, the spear-peg is cut out of the same piece of wood as the womerah shaft itself, and there is a slight rise in the centre of the latter to form a bridge or support for the spear. This will be more particularly referred to in the next to be described.

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* Aborigines of Victoria, 1878, i. p. 309, f. 88-92.

† Aborigines of Victoria, 1878, i. p. 310, f. 94.

It would be interesting to ascertain how far south along the eastern coast shell-mounted womerahs extend. We know that they have been observed as low as the Herbert River, off Hinchinbrook Island, but White mentions in his "Journal of a Voyage to N. S. Wales"* that our Botany Bay natives "had a stick, with a shell at the end, used by them in throwing their weapons." It is hardly likely that this could be a womerah after the type of the *Melo*-mounted weapon, but was more probably only a piece of shell placed at the extreme end and used as a scraper, after the manner of some of the womerahs from Western Australia and elsewhere.

The third womerah is of an essentially different type both in shape and mounting. It consists of a long thin heavy stick, with the usual spear peg at the distal end, but destitute of any gum-cement or supplementary object at the proximal. It is much thicker than either modification of the Lath-like Womerah. The upper edge rises excentrically into a bridge, evidently for the support of the spear as foreshadowed in Smyth's illustration previously referred to. Irrespective of the bridge, the womerah tapers from the distal to the proximal end, the latter terminating in an obtuse point. The spear-peg is small, short, very obliquely set, and fixed on with a semi-transparent rosin-like gum, having the appearance of gum-arabic and quite different from the ordinary gum-cement, and studded with the red and black-tipped seeds of *Abrus precatorius*.

This womerah is two feet eight inches long, the breadth at the proximal end being seven-eighths, at the centre one inch and five-eighths, and at the distal end one and one-eighth inches respectively. It is relatively heavier in comparison to its size than either of the two other weapons now described.

The three weapons were obtained by Mr. Harry Stockdale in the Cape York Peninsula, fifty miles south of the Cape.

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* 4to, London, 1790.

NOTES AND EXHIBITS.

Mr. Rainbow exhibited a specimen of the remarkable spider *Theridion margaritarium* described in his paper, from the Clarence River.

Mr. Waite exhibited a number of reptiles collected by Mr. Lea in the northern districts of the colony.

Mr. Garland exhibited fresh flowering specimens of the beautiful Euphorbiaceous plant *Ricinocarpus Bowmani*, F.v.M., from Adelong.

Mr. Froggatt showed specimens of galls on the stems of *Callistemon salignus* due to the attacks of a species of *Thrips*. The galls are hollow and contain an immense number of both larval and perfect forms.

Mr. Etheridge exhibited the aboriginal stone implements and womerahs described in his papers.

Mr. Fletcher exhibited a large and very interesting collection of botanical specimens, being a selection from the plants obtained by the Elder Exploring Expedition in Central and West Australia; for this very important addition to the herbarium the Society is indebted to the kind offices of Professor Ralph Tate, F.G.S., of Adelaide.

He also showed specimens of *Ruppia maritima*, Linn., one of the *Naiadeæ*, now flowering freely in a pool close to the cliffs near Manly.

Mr. Brazier contributed the following Note on the additional localities of *Astele subcarinata*, Sw.:—

"Since I wrote my paper on the above subject in Vol. viii. Pt. 1, p. 109, of these Proceedings, I see that this species is recorded by Mr. D. J. Adcock in his 'Hand-List of the Acquatic Mollusca of South Australia' (p. 9, No. 357, 1893). On writing to my old friend and correspondent Mr. W. T. Bednall, he informs me that there is a small specimen in the South Australian Museum, dredged in Spencer's Gulf. Mr. Bednall mentions having had a large specimen by him for many years without knowing its name. 'When a lad many years ago, in the "fifties," I dug it out of the ground in Adelaide, close to where I was living. When I found out what it was I thought it must have been brought from Tasmania; but since it has been dredged in our waters there is just a possibility it may have been cast ashore here—although I have never seen a sign of it when collecting. Very curious I should have come by it in this way. I remember I proceeded at once to clean the outside off to make it look pretty, which I was sorry for afterwards when I found out what a good shell I had got.'

"The recorded localities for this rare shell up to date stand as undermentioned :—

"East coast of Tasmania *(Dr. Milligan)*; Tasmania *(Cuming)*; Circular Head, north coast of Tasmania *(Brazier)*; Rocky Cape, near Circular Head *(Miss Mary Lodder)*; Port Sorell, north coast of Tasmania *(Mrs. Dumbelton)*; Spencer's Gulf, South Australia *(Coll. South Australian Museum, W. T. Bednall)*; a few miles N.E. of Troubridge Shoal, St. Vincent Gulf *(one specimen dredged by Mr. E. H. Mathews, 1893)*.

"The other recorded species is *Astele multigrana,* described by Dr. George Dunker in the Malakozoologische Blätter, Vol. xviii. p. 169, No. 55, 1871, under the name of *Ziziphinus multigranus,* from St. Vincent, Novæ Hollandiæ.

"Some few years ago I received from Mr. Bednall a number of South Australian shells to name for him, and in the lot I found three specimens, with a note of the locality, 'beach specimens obtained at the Semaphore by Mr. Forward, and a note from Professor Tate, having dredged three immature specimens off Port Vincent, South Australia, 3 fathoms.'

"Our New South Wales species, *Astele scitula,* A. Adams, is found under stones at low water at Watson's Bay, Vaucluse, Shark

Island, Point Piper, and other places near the Heads, off George's Head (12 fathoms, weeds), and between Ball's Head and Goat Island (18 fathoms, broken shells and stones)."

Mr. Brazier also showed specimens of *Marginella pulchella*, Kiener, from Norfolk Island, a species reputed to have been first found at Sydney, specimens of which, indeed, of late years have been found at Long Bay, near Sydney, by Mrs. G. J. Waterhouse; also specimens of pumice collected at Norfolk Island, with a query as to its probable source; a specimen of *Astele multigrana*, Dunker, from Spencer's Gulf, S.A.; and samples of a supposed volcanic (?) rock from Watson's Bay to the north of the jetty.

WEDNESDAY, SEPTEMBER 27TH, 1893.

The President, Professor David, B.A., F.G.S., in the Chair.

The President took the opportunity of reminding Members intending to contribute papers that in accordance with the new By-laws the Meeting in November would close the present Session—that is to say, that there would be a recess during December-February inclusive.

The President announced also that the last few sheets of the Macleay Memorial Volume were now being printed off, and that the Volume would be ready for issue in a few days.

DONATIONS.

"Bombay Natural History Society—Journal." Vol. vii. No. 2 (1892). *From the Society.*

Pamphlet entitled—"On the Nest and Eggs of *Gerygone magnirostris*, Gould." By A. J. North, F.L.S. (1893). *From the Author.*

"Pharmaceutical Journal of Australasia." Vol. vi. (1893), No. 8. *From the Editor.*

"Zoologischer Anzeiger." xvi. Jahrg. Nos. 425-426 (July-August, 1893). *From the Editor.*

"Royal Irish Academy—Transactions." Vol. xxiv. (Antiquities), Part 8 (1867); Title-page and Index Vol. xxiv., "Polite Literature and Antiquities"; Vol. xxix. Part 17 (1891). *From the Academy.*

"Perak Government Gazette." Vol. vi. (1893), Nos. 19-21 *From the Government Secretary.*

"Geological Society of London—Journal." Vol. xlix. Part 3 (1893). *From the Society.*

"Royal Society of Queensland—Proceedings, 1892-93." Vol. ix. *From the Society.*

"United States Department of Agriculture—Division of Ornithology and Mammalogy—North American Fauna." No. 7 (1893). *From the Secretary of Agriculture.*

"American Geographical Society—Bulletin." Vol. xxv. No. 2 (1893). *From the Society.*

"American Naturalist." Vol. xxvii. No. 319 (July, 1893). *From the Editor.*

"Museum of Comparative Zoology at Harvard College—Bulletin." Vol. xxiv. Nos. 4-5 (June-July, 1893). *From the Curator.*

"Agricultural Gazette of New South Wales." Vol. iv. (1893), Part 8. *From the Hon. the Minister for Mines and Agriculture.*

"Victorian Naturalist." Vol. x. No. 5 (September, 1893). *From the Field Naturalists' Club of Victoria.*

"American Museum of Natural History—Bulletin." Vol. v. (1893), sheet 9, pp. 129-144. *From the Museum.*

"Asiatic Society of Bengal—Journal." Vol. lxii. Part i. No. 1; Part ii. No. 1 (1893): "Proceedings, 1893." Nos. 2-6. *From the Society.*

"Verein für vaterländische Naturkunde in Württemberg—Jahreshefte." xlix. Jahrg. (1893). *From the Society.*

"Archiv für Naturgeschichte." lvi. Jahrg. (1890), ii. Band, 1 Heft; lviii. Jahrg. (1892), ii. Band, 2 Heft; lix. Jahrg. (1893), i. Band, 2 Heft. *From the Editor.*

"Senckenbergische naturforschende Gesellschaft zu Frankfurt a. M.—Abhandlungen." xviii. Band, 1 Heft (1892). *From the Society.*

"Naturhistorischer Verein des preussischen Rheinlande, Westfalens und des Reg.-Bez. Osnabrück—Verhandlungen." Fünfte Folge. x. Jahrg., Erste Hälfte (1893). *From the Society.*

"Department of Mines, Sydney—Geological Map of N.S.W." Prepared under the direction of E. F. Pittman, A.R.S.M., Government Geologist (1893). *From the Hon. the Minister for Mines and Agriculture.*

"Comité Géologique, St. Pétersbourg—Mémoires." Vol. ix. No. 2 (1893); Vol. x. No. 2 (1893): "Bulletin." Vol. xi. (1892), Nos. 9-10; Vol. xii. (1893), Nos. 1-2. *From the Committee.*

"Australasian Journal of Pharmacy." Vol. viii. No. 93 (September, 1893). *From the Editor.*

BOTANICAL NOTES FROM THE TECHNOLOGICAL MUSEUM, SYDNEY.

No. I.

By J. H. Maiden, F.L.S., and R. T. Baker, F.L.S.

(Plate xv.)

ANONACEÆ.

Melodorum (Unona) Leichhardtii, F.v.M.

A plant showing an entire absence of tomentum is found near Tintenbar, Richmond River, N.S.W., collected by Mr. Bäuerlen, Botanical Collector to the Technological Museum, Sydney. It may not here be out of place to refer to Bentham's query regarding the flexuose nature of the branches of this species (B.Fl. Vol. i. 52). The species is mentioned by other authors except Mr. Bailey (Syn. Qd. Flora) as a tree, but all specimens (which include both the typical form and varieties) examined by us from the Richmond River are from plants described as simple climbers or "straggling vines." The plant goes by the name of "Vinegar Bottles," owing to the acidulousness of its fruits.

It will be observed that the above notes mainly confirm the correctness of Mueller's pre-Flora Australiensis description of *Unona Leichhardtii (Fragmenta,* iii. 41).

LEGUMINOSÆ.

Hovea acutifolia, A. Cunn. in G. Don, Gen. Syst. ii. 126, and B.Fl. ii. 174.

The pod of this species is undescribed in the above and later works, Bentham expressly stating "pods not seen." In the analysis of the genus the species is placed with those having a "*pod tomentose* or *villous*," a classification which of course could only be tentative under the circumstances.

The pods, accompanied by flowering specimens, have been received from Tintenbar (W. Bäuerlen) and Port Macquarie (G. R. Brown), and are 4-5 lines long, sessile and quite glabrous, except on the sutures, which are margined with short rusty hairs just like the pods of *H. linearis* and other so called glabrous pods. This will necessitate a slight alteration in Bentham's classification, *H. acutifolia* being removed from the "pod tomentose" group and placed with *H. heterophyllus* and *H. linearis*, both having glabrous pods. Mr. Bailey (Syn. Qd. Flora, p. 96) has recorded that the pods of *H. acutifolia* are nearly glabrous, but the above notes are necessary as a matter of classification.

GUILANDINA (CAESALPINIA) BONDUCELLA, Linn.

This species is recorded in Baron Mueller's Census as occurring in this colony, but we cannot trace any definite locality in N.S.W. given for it. It has been sent by Mr. Bäuerlen from Tintenbar.

ACACIA UNDULIFOLIA, Fraser.

This species is now recorded from Mudgee over the Dividing Range and Capertee Valley. The localities given by us for plants belonging to to the Mudgee district supplement Mr. Hamilton's local flora, Proc. (2), ii. 259.

ACACIA LEPROSA, Sieb.

This species occurs sparingly at Woodville, about 10 miles south of Ulladulla. This is now its most northern locality.

ACACIA MELANOXYLON, R.Br.

This species has been received from the following localities:—North of Port Jackson; Mudgee district, Ilford (R.T.B.); Glen Innes (Deverell); Booloomboyt, Myall Lakes (A. Rudder); Ballina (W. Bäuerlen).

ACACIA LONGIFOLIA, Willd.

Trees belonging to this species are found in the gullies of the upper course of the Goulburn River, N.S.W., with remarkably long phyllodes varying from 16 to 20 inches.

ACACIA GLAUCESCENS, Willd.

This species has been found 27 miles south of Sydney at Helensburgh (Mr. H. O. Rotton); also by Mr. H. Deane and Rev. T. V. Alkin at George's River, near Liverpool, 22 miles south of Sydney; this is now the nearest recorded locality to Sydney.

ROSACEÆ.

POTENTILLA ANSERINA, Linn.

This species, hitherto only recorded from South Australia, Tasmania, and Victoria, has been found at Bibbenluke Station, Cooma, by Miss Edwards, and also between Bombala and Cooma by Mr. T. C. Burnell. On the Snowy River it has been collected by Mr. W. Bäuerlen.

MYRTACEÆ.

DECASPERMUM (NELITRIS) PANICULATUM, Baillon, B.Fl. iii. 279.

A small tree 15 to 20 feet high at Tintenbar, Richmond River, N.S.W. (W. Bäuerlen). Previously only received from Queensland.

EUCALYPTUS AMYGDALINA, Labill.

A broad-leaved variety of this species has been found as far north as Rylstone, where it goes by the name of Blue Peppermint; not common. Height 40 feet, diameter 15 inches.

EUCALYPTUS PIPERITA, Sm.

Peppermint. This species extends from Rylstone to Capertee. Not in Mr. Hamilton's list.

EUCALYPTUS PUNCTATA, DC.

This species extends from Rylstone to Capertee. Not in Mr. Hamilton's list.

EUCALYPTUS SALIGNA, Sm., var.

The Grey Gum of the north coast districts. This gum yields a timber of economic importance, as it bears the highest local reputation for durability, and it is one of the best known ironbark substitutes. It has also certain affinities to *E. viminalis.* It became a matter of importance a few months ago to determine its botanical position with precision, and we show it to be a variety of *Eucalyptus saligna* (usually known as Blue or Flooded Gum in New South Wales), and we indicate its relation to the typical species and to *E. viminalis*, Labill.

GREY GUM.

Flower-buds: Generally resembling *E. saligna*, but operculum less drawn out to a beak, the calyx and operculum being far more globular and also smaller, operculum dome-shaped.

Flowers: Anthers most like those of *E. saligna.* Blossoms in January and February. Upper Gloucester (Rudder).

Fruits: Strongly resemble in outward appearance those of a small-fruited form of a Manna Gum, such as is found at Bombala and other places in southern New South Wales. Fruits in tens (usually). Rim broader, and its edge sharper. Fruits usually rather smaller and more conical or angular in shape. Common pedicel very flat and about an inch long. Invariably pedicellate as far as seen.

Leaves: Resemble *E. saligna* as regards consistence and venation. They are very different from those of *E. viminalis.*

Bark: Invariably deciduous to the roots. Grey, with a loose mealy surface.

Timber: A most lasting timber. "I have seen a post, 40 years in the ground, which shows no sign of decay" (Rudder). Is red, and might easily be mistaken for ironbark.

Habitat: Open and scrubby (not alluvial) forests, north coast districts.

E. SALIGNA.

Flower buds: Somewhat resembling *E. viminalis*, but the calyx more attenuate and flattened.

Flowers: Blossoms about April. Upper Gloucester (Rudder).

Fruits: Fruits larger. Rim thinner. Valves set deeper in calyx tube. Peduncles usually longer, broader and flatter. Pedicels broader and flatter and sometimes almost absent.

Leaves: "Lateral veins quite numerous, subtle and almost transversely spreading, the two longitudinal veins only slightly or hardly removed from the edge" (F.v.M.)

Bark: (Blue or Flooded Gum of N.S.W.) Varies a good deal in different districts in the extent to which the fibrous bark extends up the stem, *i.e.*, from a foot or two to perhaps 40 or 50 feet. Following is a description of the bark in the districts in which Grey Gum also occurs:—Bark usually almost milk-white, or a very pale bluish-grey, and quite smooth, except on the butt, where it is dark brown, rough and persistent.

Timber: Pale red, not specially lasting.

Habitat: Near streams, and generally on alluvial and moist land, coast district and Dividing Range.

E. VIMINALIS.

Flower buds: No observations.

Flowers: No observations.

Fruits: In threes.

Leaves: "Lateral veins rather subtle, crowded, pinnately spreading, the circumferential vein rather removed from the edge of the leaf" (F.v.M.).

Bark: (Manna Gum; White Gum.) Deciduous.

Timber: A very inferior timber, liable to gum veins, and very perishable.

Habitat: No observations.

RUBIACEÆ.

PSYCHOTRIA NEMATOPODA, F.v.M.

Baron von Mueller, in mentioning the occurrence of this plant at Rockingham Bay, Queensland (*Fragmenta*, ix. 184), states—"Planta Novam Austro-Cambriam attinet." It is, however, not recorded in the "Census" as a New South Wales plant. Mr. Bauerlen has sent this species to the Museum from North Creek, Ballina, Richmond River, N.S.W. It is a small tree 8-12 feet high, with reddish fruits.

COMPOSITÆ.

OLEARIA (ASTER) IODOCHROA, F.v.M.

This species has been collected as far north as Cooma, N.S.W., by Miss F. Harpur.

EPACRIDEÆ.

EPACRIS CORIACEA, A. Cunn.

Waterfall, 24 miles south of Sydney (H. Deane); Helensburgh, 27 miles south of Sydney (H. O. Rotton).

SAPOTACEÆ.

SIDEROXYLON (ACHRAS) MYRSINOIDES, Benth.

Specimens collected by Mr. W. Bauerlen, at Lismore, Richmond River, N.S.W., have their flowers on pedicels exceedingly short or even sessile, the length of pedicel in the typical form being 3 to 5 lines long.

SCROPHULARINEÆ.

VERONICA DERWENTIA, Andr.

This plant has been found by Miss Liddle at Lue, Mudgee district, N.S.W. Not in Mr. Hamilton's list.

LAURINEÆ.

TETRANTHERA FERRUGINEA, R.Br., B.Fl. v. 305.

Syn.—*Litsœa Hexanthus*, A. de Juss.

This species, hitherto only found in Queensland, has been sent by Mr. Bäuerlen from Alstonville, Richmond River, where it is a small tree 20-40 feet high and with a stem diameter of 9-12 inches.

LITSÆA DEALBATA, Nees, var. *rufa*, B.Fl. v. 308.

This variety has only hitherto been recorded (as to New South Wales) from the Blue Mountains. Mr. W. Bäuerlen has sent it from Alstonville, Richmond River, where it is a small tree 30-40 feet high and with a diameter of 6-10 inches

PROTEACEÆ.

GREVILLEA CAPITELLATA, Meissn.

Helensburgh (H. O. Rotton); Waterfall (H. Deane).

EUPHORBIACEÆ.

PHYLLANTHUS FERDINANDI, var. *supra-axillaris*.

This variety, hitherto only recorded from Queensland, has been received from Ballina and Tintenbar, Richmond River (W. Bäuerlen), where its height is 20-30 feet, diameter 9-15 inches; in this locality it goes by the name of Water Gum, perhaps through confusion with *Tristania.*

AMPEREA SPARTIOIDES, Brong.

(Plate xv. figs. 1*a-c*.)

In the Flora Australiensis the female flowers of *A. spartioides* are referred to as "solitary, either alone or surrounded by a few males," and so far as known this is not qualified by other botanists. A number of specimens obtained from the head of Double Bay, Port Jackson (W. W. Froggatt), have the female flowers shortly pedicellate, the pedicel growing till a fruit matures, when it attains to a length of over half an inch; and in scarcely any instance are they solitary, but generally three or four clustered at the nodes. We may observe that all the specimens of this species hitherto seen by us are monœcious.

FILICES.

BLECHNUM CARTILAGINEUM, Swartz.

(Plate xv. fig. 2.)

Specimens of this fern from Mr. W. Bäuerlen, Richmond River, N.S.W., have their pinnæ bifid at the extremities, a variation which does not appear to have been hitherto recorded in connection with this species.

BLECHNUM SERRULATUM, Rich.

A form of this fern collected by Mr. W. Bäuerlen (Ballina, Richmond River, N.S.W.) has exceptionally attenuate pinnæ, each pinna tapering its entire length.

EXPLANATION OF PLATE.

Fig. 1.—*a.* Part of stem, showing pedicellate female flowers of *Amperea spartioides* (nat. size).
b. Female flowers (magnified).
c. Capsule (magnified).
Fig. 2.—Pinnæ of a frond of *Blechnum cartilagineum*, showing bifid and trifid terminations (nat. size).

DESCRIPTIONS OF NEW SPECIES OF *BOSTRYCHIDÆ.*

By Arthur M. Lea.

The following species of the above family were obtained principally at Tamworth, while on a collecting trip for the Department of Agriculture last summer, the majority by barking Eucalypts and searching them at night-time with a light.

Apate serrata, n.sp.

Elongate, cylindrical, reddish-piceous, shining. Head punctate, less so on the clypeus and vertex than on the occiput; clypeal suture with a shallow slightly hairy fovea in the middle. Thorax slightly transverse, with two small depressions at the base, rough and dentate in front, and slightly punctate behind and at the sides. Scutellum dark piceous, minutely punctate. Elytra coarsely punctate, less so towards the base, rapidly sloped away at about a third from the apex, with the apical two-thirds dark piceous. The retuse portion is serrately margined all round and lightly covered with short yellowish hairs, and with the suture raised, the margins are slightly swollen in the middle, with the apex flatly projecting a short distance beyond the abdomen. Undersurface of body reddish-castaneous, minutely punctate, and clothed with a fine whitish pubescence. Antennæ reddish-testaceous, the last three joints much paler. Legs slightly hairy, very minutely punctate, reddish-testaceous, with the tibiæ reddish-piceous, the anterior and posterior dentate, and all spurred, the posterior spurs the longest. Length 4½-6 mm.

Gosford and Tamworth, N.S.W.

Apate subcostata, n.sp.

Elongate, cylindrical, dark castaneous, shining. Head inclining to piceous, densely and minutely punctate; clypeus shining, with a few small punctures, and a well-marked fovea in its suture.

Thorax dark reddish-testaceous, as broad as long, with two small depressions at the base, rough and dentated in front and lightly punctate at the base and sides. Scutellum small, minutely punctate. Elytra reddish-piceous, especially towards the apex, punctate, a little less so towards the base, with the humeral angles slightly prominent, shining, and almost impunctate; midway between the suture and the humeral angle is a small costa, commencing at a little hump near the scutellum, and proceeding for about a third the length of the elytra, and invisible from above, the elytra slope rapidly down from about a third from the apex, and are margined all round, except on the upper part near the suture; the sides of the suture are raised, commencing at the slope, and gradually increasing to the apex, where they join in with, and in height are nearly equal to, the marginal rim, this in the middle is slightly wavy and minutely toothed at the apex. Undersurface of body slightly hairy, minutely punctate, and dark reddish-testaceous, the abdominal segments tinged with piceous. Legs reddish-testaceous, with the knees darker. Antennæ reddish-testaceous, shining, the three apical joints paler, opaque, and minutely pubescent. Length 4¼-5 mm.

Tamworth.

A narrower, smaller and less hairy insect than the last, with the elytra more evenly punctured.

Apate excavata, n.sp.

♂. Of a narrow cylindrical form, shining, lightly punctate. Head dark piceous, densely punctate, with a fovea in the centre, clypeus, labrum, and a spot above the suture reddish-piceous. Thorax testaceous, longer than broad, smooth, shining and impunctate behind, and very slightly and shallowly punctate at the sides, rough and dentated in front, with two recurved black-tipped spines overhanging the head, other teeth also black-tipped. Elytra about two and a half times the length of the thorax, shining, densely but minutely punctate, pitchy, testaceous at the base, the humeral angles slightly raised, the sides straight except for an interruption in the middle; at about a third from the apex the elytra sloped rapidly away, and, when on a level with the lateral margins, extended downwards and forwards; the retuse portion is duller than the rest of the elytra, with the punctures larger, is margined to within about a third of the suture on the upper part, with four teeth on each elytron, one near the suture, another a little further on, and at the termination of the marginal rim, both thick, and subacute, and two at the apex opposite to them, flatter and less sharply pointed; there is also on the under portion of the apex of each elytron a sharp spine, extending downwards. Undersurface of body pitchy, shining, very sparingly pubescent; the abdominal segments edged with testaceous, the apical ones excavated, with, on each side of the excavation, a broad half-raised shining lightly punctate semi-rounded plate, and in front of it two long flat reddish-testaceous bundles of hairs, appearing like obtusely pointed spines. Legs testaceous, knees and trochantins tinged with piceous. Length 5¾ mm.

Tamworth.

APATE BICOLOR, n.sp.*

Elongate, cylindrical, shining and punctate. Head black, dull, with a fovea in the centre. Thorax testaceous, darker in front than behind, about as broad as long, rough and dentated in front, with the anterior tooth recurved, behind and at the sides smooth, shining and impunctate, and minutely hairy at the base. Elytra pitchy, shining, the base tinged with testaceous, more than twice as long as the thorax, shallowly and densely punctate, obliquely truncated at about two-fifths from the apex; the retuse portion dull, slightly hairy, margined nearly all round, and punctate, the punctures larger and coarser on the upper portion, entirely disappearing towards the apex, and with two short projections on each elytron, one near the suture, the other about the same distance from it, at the termination of the marginal rim, slightly longer and extending downwards and slightly inwards; lateral margins of the elytra wavy. Undersurface of body punctate,

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* Since this paper was read I have found that this is *A. excavata* (♀), having obtained a number of specimens *in copulâ* at Forest Reefs and Galston, N.S.W.

covered with a yellowish pubescence, pitchy, the abdominal segments tinged and edged with red, with the apical one entirely red. Legs, antennæ, and palpi testaceous. Length 6½ mm.

Sydney.

Having a strong superficial resemblance to the preceding species.

APATE RETUSA, n.sp.

Oblong, reddish-piceous, shining and punctate. Head pitchy, densely punctate, with a punctate fovea in the centre of the clypeal suture, and the head lighter in colour and less punctate immediately behind it. Thorax piceous-red, darker in front than behind, slightly transverse, convex, granulated and dentate in front, smooth, shining and very minutely punctate behind and having a very minute pubescence at the base. Elytra darker than the rest of the body, except towards the base, truncated at about two-fifths from the apex, humeral angles slightly prominent and minutely punctate; balance of elytra coarsely and densely punctate, the punctures increasing in size towards the apex, and largest and deepest on the retuse portion, which is nearly black, dull, finely hairy, and margined all round, the margin very slight on the upper portion near the suture, at the middle it is produced outwards and slightly wavy, with the apex terminating in a flat projection which extends a short distance beyond the abdomen; between the suture and the humeral angle are two costæ, invisible from above and extending from the base to the declivity of each elytron. Underside of body dark reddish-testaceous, minutly punctate, more densely on the abdomen, and sparingly clothed with a fine whitish pubescence; the apical abdominal segment has a fovea in the centre, and behind it a shallower one on each side. Legs piceous-red, minutely punctate and pubescent; antennæ very little paler. Length 5¾ mm.

Tamworth.

Somewhat resembles *Rhizopertha collaris*, Macl., in appearance, but its more elongate form, and complete margin to the retuse portion of the elytra, will readily distinguish it; in that species the thorax is entirely black.

XYLOPERTHA (?) COMPRESSA, n.sp.

Oblong, piceous-red, moderately shining, punctate and clothed above and below with short erect whitish hairs. Head densely punctate, with the clypeus and mandibles black. Thorax convex, longer than wide, minutely granulated except towards the base, which is punctate. Elytra about one and a half times the length of the thorax, darker, punctate in rows, with very small punctures on the intervening spaces, roundly sloped away at about two-fifths from the apex. Abdomen punctate, second and third abdominal segments much shorter and darker than the others, which are testaceous. Legs paler, punctate, thin and flat, especially the four posterior tibiæ, with all the tibiæ fringed with hairs. Antennæ clear reddish-testaceous. Length 3¼ mm.

Tamworth and Sydney.

XYLOPERTHA (?) HIRSUTA, n.sp.

Narrow, cylindrical, shining, punctate, reddish-testaceous, and covered with minute erect whitish hairs. Head minutely punctate Thorax convex, longer than wide, covered with small granulations in front, shining and impunctate behind, and lightly punctate at the sides. Elytra about 1¼ times the length of the thorax, punctate in rows, the punctures very small and close together; roundly sloped away at about a third from the apex. Abdominal segments paler than the upper surface, especially in ♀, except the three apical ones, which are darker in ♂. Legs and antennæ testaceous; four posterior tibiæ broad, flat, dentated and fringed with hairs. Length 2¾ mm.

Tamworth, Cootamundra, Tweed and Richmond Rivers, N.S.W.

Resembling the preceding species in outline, but distinguished from it by its smaller size, narrower shape, and more uniform colouring.

XYLOPERTHA (?) PARVA, n.sp.

Of a rather narrow form. Head tinged with piceous, minutely punctate, and with a shallow fovea in the centre. Thorax testaceous, rough and slightly hairy and darker in front and smooth but dull behind. Elytra reddish-testaceous, hairy, when looked at endways the hairs appearing in rows, minutely punctate, about 1¼ times as long as the thorax. Legs, antennæ, and undersurface of body testaceous, with the exception of the abdominal segments, which are of the same colour as the elytra and minutely punctate. All the tibiæ broad, flat, minutely dentate and hairy, the anterior less so than the four posterior. Length 2 mm.

Richmond River.

Somewhat resembles the last in appearance, but is distinguished from it by its smaller size, different colouring, and less hair, especially on the under parts.

The species described below appears to belong to a new genus; the following are its principal characters:—

AMASA, n.g.

Head invisible from above; antennæ with 10 joints, first longer than 2-7, second as long as 3-7, 8-10 transverse, forming a closely joined broad compressed club, scarcely longer than broad.

Thorax granulated.

Elytra retuse behind, not spined.

Legs compressed, tibiæ very much so, especially the posterior pair; tarsi slender, 5th joint much the longest.

AMASA THORACICA, n.sp.

Of a short oblong form, shining and punctate. Head reddish-testaceous, minutely punctate, and with a medial line on the occiput, the mouth parts fringed with yellowish-white hairs. Thorax testaceous-red, very convex above, rough and minutely granulate and hairy in front, and densely and very minutely punctate all over. Elytra shining, dark reddish-piceous, not one and a half times as long, and slightly narrower than the thorax, lightly punctate in rows, with the intervening spaces extremely minutely punctate, abruptly truncated at a little more than half their length, with the retuse portion broad, margined all round, concave, finely punctate and hairy, fringed with hairs, and with three elevated ridges on each side of the suture, extending the whole length of the retuse portion, all minutely granulate, the central one the widest. Undersurface of body piceous-red, minutely punctate and hairy. Legs testaceous, thin and flat, thighs moderately shining, tibiæ hairy, much flattened, especially the four posterior, minutely punctate and dentate, tarsi clear, shining, and thread-like; antennæ clear testaceous. Length 3 mm.

Tamworth and Armidale.

The specimen I have from Armidale has the medial line on the head more distinctly marked, with the retuse portion of the elytra hairless and the granulated ridges more distinct.

I also obtained the following species at Tamworth:—

Rhizopertha elongatula, Macl., Mast. Cat. No. 3643.

R. gibbicollis, Macl., Mast. Cat. No. 3644.

Apate Lindi, Blackb., P.L.S.N.S.W. 1889, p. 1263.

Bostrychus jesuita, Fabr., Mast. Cat. No. 3641.

B. bispinosus, Macl., Mast. Cat. No. 3639.

B. cylindricus, Macl., Mast. Cat. No. 3640.
This last also at Gosford and Sydney.

PRELIMINARY NOTE ON A *BALANOGLOSSUS* FROM THE COAST OF NEW SOUTH WALES.

By Jas. P. Hill, F.L.S., Demonstrator of Biology, Sydney University.

During a recent collecting trip to Broken Bay I had the good fortune to find the first examples of *Balanoglossus* recorded from Australia. The first specimen found was picked up, by a boy I had with me, adhering to the underside of a large stone on the ocean beach opposite Creel Bay, Barranjoey. Subsequent search revealed its presence in considerable abundance. More recently, during a dredging expedition organised by Professor Haswell to Jervis Bay, I found a single specimen, similar to those from Barranjoey, adhering to the underside of a stone; and systematic search will no doubt reveal its existence at many other points on the coast.

The normal habitat of the animal is in loose gravelly sand, especially in the loose sand under large stones, between high and low water marks. It secretes abundant mucus, to which sand particles adhere, thus forming a sort of tube. The anterior part of the animal is in some of a bright orange colour, the posterior part being colourless, while others are colourless throughout; this difference in colour probably indicates a sexual difference. None of the odours so characteristic of some other species of *Balanoglossus* were detected.

The largest specimen found measured, when only moderately extended, over 7 inches and over an inch in circumference. When fully extended it would measure considerably over a foot; but the majority of the individuals were much smaller.

In a future paper I hope to lay before you the results of a microscopic examination of this form, which is in all probability a new species.

NOTE ON THE PRESENCE OF VESTIGIAL MUELLERIAN DUCTS IN A FULL-GROWN MALE LIZARD *(AMPHIBOLURUS MURICATUS).*

By Jas. P. Hill, F.L.S., Demonstrator of Biology, Sydney University.

In a paper* on "The Vestigial Structures of the Reproductive Apparatus in the Male of the Green Lizard," Howes has described some interesting cases of the persistence of the Müllerian ducts in males of this species. In one male observed by him the oviducts were "all but fully developed," while in another a complete oviduct was present on one side; in a large number of specimens examined by him, remnants of the oviducts were found in the form of more or less isolated membranous tubes with blind ends, present on one or both sides. Other observers have noted their presence in allied genera and species, but, so far as I am aware, they have not been noticed in any Australian genus. In an adult male lizard, *Amphibolurus muricatus,* a form common in the scrubs round Sydney, which I dissected lately, well-marked rudiments of the Müllerian ducts were present. A number of other males were examined, but none showed any trace of Müllerian ducts; so that in this genus it appears they are not so generally present as in *Lacerta viridis.*

In the specimen observed, the male genital organs resemble, in essential detail, the condition in *Lacerta viridis.* The epididymes, that of the right side attached to the outer edge of the testis, that of the left to the dorsal surface of the corresponding testis, were supported by the broad ligament attached in front to the pigmented peritoneum of the dorsal body-wall. The Müllerian ducts were represented by two blind membranous tubes, 29 mm. in length and 2 mm. in greatest breadth, running along the outer margins of the broad ligaments and following the course of the epididymes, that of the right side being slightly the longer. The duct of the left side was continuous throughout its entire length and posteriorly it terminated blindly in front of the left kidney. Its anterior portion disposed in front of the testis formed an obtuse angle with the posterior part of the duct, and clearly represented the funnel-shaped anterior end of the fully-formed oviduct. The corresponding portion of the right duct was connected with the posterior part of the duct only by a delicate filament which passed, in the broad ligament, round the anterior outer dorsal border of the testis of that side; its posterior end terminated like the left just in front of the right kidney.

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* Journal of Anatomy and Physiology, Vol. xxi. p. 185.

NOTES AND EXHIBITS.

Mr. R. Helms, in view of his inability to be present at the next Meeting of the Society at which his paper will be formally read, gave an outline of a very important communication on the evidence of extensive glacier action at the Mt. Kosciusko Plateau, recently observed by him.

Mr. North drew attention to the unusually large number of cuckoos at present in the neighbourhood of Sydney, and exhibited a set of eggs, consisting of two eggs of *Acanthiza pusilla* and an egg each of three different species of cuckoos, viz., *Lamprococcyx plagosus, L. basalis*, and *Cacomantis flabelliformis*, taken on the 31st ult. from a nest of *A. pusilla* built in a low shrub on the Woolli Creek. Another nest of *A. pusilla*, examined on the 13th inst. and built in the near vicinity to where the previous one was taken, contained a single egg of *C. flabelliformis*, but on visiting it the following day the egg was missing and an egg of *L. basalis* found in its place. Several nests of *Maluri* and *Acanthizæ* found during August and the present month contained in some instances, in addition to the eggs of the rightful owners, an egg each of *L. plagosus* and *L. basalis;* in others, two eggs of the one species of bronze cuckoo. It is worthy of note that in many nests the eggs of the cuckoos were deposited before those of the would-be foster-parents, and that the entrances to the dome-shaped nests were greatly enlarged, more especially in the nests where the eggs of *C. flabelliformis* were found. The interior of the nests of the *Maluri* and *Acanthizæ* is only half the size or bulk of the latter parasitical intruder.

Mr. A. Sidney Olliff exhibited specimens of the sugar-cane weevil (*Sphenophorus obscurus*, Boisd.), recently bred from cocoons received from Northern Queensland. The species was stated to be exceedingly destructive to sugar-cane and bananas in the

Sandwich Islands, Fiji, and New Ireland, where it is found boring in the stems of the plants much in the same way as the sugar-cane moth borer (*Nonagria exitiosa*, Oll.). The *Sphenophorus* has not been recorded from Australia previously, and it is significant that the specimens now exhibited were found in cane in cultivation in Queensland, but only recently imported from New Guinea.

He also showed specimens of a remarkable parasitic fly (Fam. *Tachinidæ*) bred from adult beetles of the two-spotted Monolepta (*Monolepta rosea*, Blk.), a destructive plant-eating species.

Messrs. Maiden and Baker showed the plants referred to in their paper.

Mr. Maiden exhibited sections and photographs (of both external and internal structure) of fresh specimens of Native Bread (*Mylitta australis*), showing the irregularly netted appearance of the fungus, which cannot be called hexagonal. He also announced the almost complete absence of pectin in this fungus, and stated, as the result of experiments not quite complete, that the tissue appears to mainly consist of a modification of cellulose, most probably fungin.

Mr. Maiden also showed (on behalf of Mr. A. J. Sach, of the Technological Museum, Goulburn) a supposed aboriginal implement of stone, shaped like a dagger, whose use appears to be somewhat obscure, although it is deemed to have been used for beating fibres or seeds for food.

Mr. Brazier exhibited a block of wood of undetermined species, probably a Protead, from New Caledonia.

Mr. Lea exhibited the Coleoptera—new species of *Apate*, *Xylopertha*, and of a new genus—described in his paper, chiefly from Tamworth, N.S.W.

Mr. Helms exhibited a glacier-polished slab of slate from an old moraine at the base of Mt. Twynam, Snowy Mts., Australian Alps.

Mr. Hill exhibited a specimen of *Balanoglossus*, and an anatomical preparation of the lizard referred to in his paper, showing a condition of things analogous to that recently described by Professor G. B. Howes in *Lacerta viridis* (Journ. Anat. and Phys. xxi. p. 185), but of rarer occurrence, as only one out of a number of specimens examined presented the features described.

Mr. Henry Deane showed an interesting collection of sixty-six plants collected by him a month ago at Broken Hill and Tarrawingee, and determined by Baron von Mueller. Following is a list of the species :—

CRUCIFERÆ, *Lepidium papillosum*, F.v.M.; *L. ruderale*, Linn.; *Erysimum lasiocarpum*, F.v.M.; *Sisymbrium trisectum*, F.v.M.: MALVACEÆ, *Sida virgata*, Hook.; *Abutilon Fraseri*, Hook.; *Lavatera plebeia*, Sims: ZYGOPHYLLEÆ, *Zygophyllum ammophilum*, F.v.M.; *Z. iodocarpum*, F.v.M.; *Z. crenatum*, F.v.M.; *Z. fruticulosum*, DC.: GERANIACEÆ, *Erodium cygnorum*, Nees; *E. moschatum*,* Willd.: SAPINDACEÆ, *Dodonæa lobulata*, F.v.M.: LEGUMINOSÆ, *Clianthus Dampieri*, A. Cunn.; *Swainsona* sp.; *S. stipularis*, F.v.M.; *Acacia sentis*, F.v.M.: CUCURBITACEÆ, *Cucumis myriocarpa*,* Naudin: FICOIDEÆ, *Tetragonia expansa*, Murray: UMBELLIFERÆ, *Daucus brachiatus*, Sieb.: COMPOSITÆ, *Gnaphalodes uliginosum*, A. Gray; *Gnephosis Burkittii*, Benth.; *Helipterum pygmæum*, Benth.; *H. corymbiflorum*, Schl., and var. *microglossum*, F.v.M.; *H. polygalifolium*, DC.; *H. incanum*, DC.; *H. moschatum*, Benth.; *Brachycome pachyptera*, Turcz.; *B. ciliaris*, Less.; *Senecio brachyglossus*, F.v.M.; *Craspedia pleiocephala*, F.v.M.; *Calotis hispidula*, F.v.M.; *Ixiolæna tomentosa*, Sond. and F.v.M.; *Elachanthus pusillus*, F.v.M.: GOODENIACEÆ, *Goodenia heterochila*, F.v.M.: ASPERIFOLIÆ, *Echinospermum concavum*, F.v.M.: CONVOLVULACEÆ, *Convolvulus erubescens*, Sims: SOLANACEÆ, *Nicotiana glauca*,* Graham; *Solanum ellipticum*, R.Br.; *S. Sturtianum*, F.v.M.: MYOPORINEÆ, *Eremophila alternifolia*, R.Br.: PLANTAGINEÆ, *Plantago varia*, R.Br.: SALSOLACEÆ, *Kochia sedifolia*, F.v.M.; *K. brevifolia*, R.Br.; *K. spongiocarpa*,

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* Introduced.

F.v.M.; *K. triptera*, Benth.; *K. villosa*, Lindl.; *Enchylæna tomentosa*, R.Br.; *Bassia sclerolaenoides*, F.v.M.; *B. diacantha*, F.v.M.; *B. bicuspis* (?), F.v.M.; *B. paradoxa*, F.v.M.; *B. lanicuspis*, F.v.M.; *B. quinquecuspis*, F.v.M.; *Salsola kali*, Linn.; *Atriplex nummularium*, Lindl.; *A. leptocarpum*, F.v.M.; *A. vesicarium*, Heward; *A. spongiosum*, F.v.M.: AMARANTACEÆ, *Ptilotus obovatus*, F.v.M.: GRAMINEÆ, *Bromus arenarius*, Labill.; *Stipa crinita*, Gaud.; *Festuca bromoides*, Linn.: FILICES, *Cheilanthes vellea*, F.v.M.

Among the plants above mentioned the most worthy of notice is *Goodenia heterochila*, F.v.M., previously recorded only from South Australia and the Northern Territory.

Mr. Deane also brought under notice specimens of *Lotus hispidus*, Desf., an introduced plant met with by him for the first time that day at Prospect.

WEDNESDAY, OCTOBER 25th, 1893.

The President, Professor David, B.A., F.G.S., in the Chair.

Mr. W. J. Stewart McKay, B.Sc., M.B., Ch.M., College Street, was elected a Member of the Society.

The following extract of a letter from Sir Joseph Hooker was communicated by Baron von Mueller, as being of very great interest to local botanists, since the name of Sir Joseph Banks will ever be identified with the vegetation of Botany Bay:—

> "I forget whether I informed you that I have at last got hold of Banks' Journal of Cook's First Voyage, or rather of my aunt's (Miss Turner's) copy of it, made when all Banks' correspondence was entrusted to my grandfather for writing a Life of Banks (see 'Nature,' xlviii. 195, June 29, 1893). The bulk of it equals that of Cook's Journal just published by Capt. Wharton. I am having a copy made in the hope of getting a publisher for it. It is most interesting and full of curious matter. Banks was a wonderful man."

DONATIONS.

"Royal Microscopical Society—Journal, 1893." Part 4. *From the Society.*

"Bombay Natural History Society—Journal." Vol. vii. (1892), No. 5. *From the Society.*

"Gesellschaft für Erdkunde zu Berlin—Verhandlungen." Bd. xx. (1893), No. 6: "Zeitschrift." Bd. xxviii. (1893), No. 2. *From the Society.*

"Société Belge de Microscopie—Bulletin." xix^{me} Année, Nos. viii.-ix. *From the Society.*

"Société d'Horticulture du Doubs, Besançon—Bulletin." (n.s.) No. 32 (August, 1893). *From the Society.*

"Zoologischer Anzeiger." xvi. Jahrg. Nos. 427-428 (August-September, 1893). *From the Editor.*

"Royal Geographical Society of Australasia: Queensland Branch—Proceedings and Transactions, 1892-93." Vol. viii. *From the Society.*

"Geological Survey of Queensland—Annual Progress Reports for 1891 and 1892": "Geological Observations in the Cooktown District." By W. H. Rands (1893): "Grass-Tree Gold Field, near Mackay." By R. L. Jack (1893). *From the Government Geologist, Queensland.*

"Australian Museum, Sydney—Records." Vol. ii. No. 5 (1893). *From the Trustees.*

"Victorian Naturalist." Vol. x. No. 6 (October, 1893). *From the Field Naturalists' Club of Victoria.*

"Public Library, Melbourne—Report of the Trustees for 1892." *From the Trustees.*

"Canadian Record of Science." Vol. v. Nos. 6-7 (1893). *From the Natural History Society of Montreal.*

"Société Royale Linnéenne de Bruxelles—Bulletin." xviii^{me} Année, No. 7 (April, 1893). *From the Society.*

"Perak Government Gazette." Vol. vi. (1893), Nos. 22-23. *From the Government Secretary.*

"Pharmaceutical Journal of Australasia." Vol. vi. (1893), No. 9. *From the Editor.*

"Californian Academy of Sciences—Occasional Papers." No iii. (1893): "Zoe: a Biological Journal." Vols. i.-ii. (1890-92). *From the Academy.*

"Academy of Natural Sciences of Philadelphia—Proceedings, 1892." Part 3. *From the Academy.*

"Cincinnati Society of Natural History—Journal." Vol. xv. Nos. 3-4 (1892-93). *From the Society.*

"Smithsonian Institution, Washington—Annual Report of the Board of Regents for the year ending June 30th, 1890: Report of the U.S. National Museum." *From the Institution.*

"Smithsonian Institution — Bureau of Ethnology: Seventh Annual Report" (1885-86): "Contributions to North American Ethnology." Vol. vii. (1890): "Bibliography of Athapascan Languages." By J. C. Pilling (1892). *From the Director.*

"Wagner Free Institute of Science—Transactions." Vol. iii. Part 2 (1892). *From the Institute.*

"L'Académie Impériale des Sciences de St. Pétersbourg—Mémoires." vii^{me} Série, T. xxviii. No. 14 (1892); T. xl. No. 1 (1892). *From the Academy.*

"Scientific Results of the Second Yarkand Mission, 1878-91." *From the Government of India.*

"Agricultural Gazette of N.S.W." Vol. iv. (1893), Part 9 *From the Hon. the Minister for Mines and Agriculture.*

"United States Department of Agriculture—Division of Entomology—Insect Life." Vol. v. No. 5 (1893). *From the Secretary of Agriculture.*

"American Naturalist." Vol. xxvii. No. 320 (August, 1893). *From the Editors.*

"Museum of Comparative Zoology at Harvard College—Bulletin." Vol. xvi. No. 13 (1893); Vol. xxiv. Nos. 6-7 (1893). *From the Curator.*

"American Museum of Natural History—Bulletin." Vol. v. Sheets 10-12, pp. 145-192 (1893). *From the Museum.*

Pamphlet entitled—"On the Relation of the Fauna and Flora of Australia to those of New Zealand." By C. Hedley, F.L.S. (1893). *From the Author.*

"Australasian Journal of Pharmacy." Vol. viii. No. 94 (October, 1893). *From the Editor.*

PAPERS READ.

NOTES ON THE FAMILY *BRACHYSCELIDÆ*, WITH DESCRIPTIONS OF NEW SPECIES.

PART III.

BY WALTER W. FROGGATT, TECHNOLOGICAL MUSEUM, SYDNEY.

(Plates XVI.-XVII.)

This Part of my notes consists of the description of a new and very remarkable species of *Brachyscelis*, received from Cobar, N.S.W., by Mr. J. H. Maiden, to whom I am indebted for the opportunity of adding it to our list of gall-making coccids. The rest of the paper contains descriptions of a number of new coccids all belonging to the genus *Opisthoscelis*. Wherever the Eucalypts grow these galls are found, and no doubt, when collections are made from all parts of Australia, this group of the Coccidæ will be greatly increased. The difficulty has not been to find galls, but to decide which are distinct species, for in some the galls are very variable, and where one species attacks several different species of Eucalypts they often differ so much that it is only by carefully examining the female coccids that one can define the specific characters. While in the genus *Brachyscelis* the female and male galls all have the opening at the apex, in the genus *Opisthoscelis* it may be either at the apex or at the base on the underside of the leaf; all the species (with one exception) described herein have only the long posterior pair of legs, with an immense prolongation of the tarsal joint, but it is not always quite truncate at the tip as in the typical *O. subrotunda;* the coccid is more elongate, with the tail more rounded, while in the last stage of the female's existence, in several of these she is so solidly attached to the base of the gall that one can only remove her in fragments. The anal appendages are either formed by two or four incurved or straight spines, sometimes in an anal ring, but more frequently this ring is absent; the spines are not always visible in all the species, but I think that they are always present in some stage of the development of every species of *Opisthoscelis.*

The larva is not, like *O. subrotunda*, finely serrate all round the outer margins, but only carrying a fringe of very short hairs or bristles on the front of the head, with a single short bristle on either side of each abdominal segment; while in four species I have examined they are generally rather broader and stouter, the eyes close behind the antennæ and the thorax swelling out slightly behind the eyes. The larva of *Brachyscelis* is not lobed in the centre of the head, and the outer margins are not serrate but fringed right round with flat feather-like cilia, close together but not touching, and truncate at the extremity, which give the larva a very beautiful appearance under the microscope.

While the true *Brachyscelidœ* are confined to the Eucalypts, *Spharœococcus* is found upon *Melaleuca* and *Leptospermum.* I have had much pleasure in handing over to Mr. Maskell several species of the latter genus that I have collected about Sydney, which will be described in the next part of the Transactions of the New Zealand Institute.

The coccids belonging to the genera *Cyclindrococcus* and *Frenchia*, both formed by Maskell, are peculiar to the Casuarinæ, so at the present time the food-plants of the chief groups of our gall-making coccids are well defined.

BRACHYSCELIS UMBELLATA, n.sp. (Pl. XVI. figs. 1-2).

♀. Gall bright green, 12 lines long, 1½ lines broad at base, 5 lines in diameter at apical rim, cylindrical, elongate, funnel-shaped, apex brown, rough, and warty, the rim sometimes curving over in irregular lumps, convex, apical orifice elongate-oval, very small, situated at the tip of a spine-like projection which springs from centre of depression but is level with outer margins of apical walls; walls of chamber soft and spongy, inner or woody shell hard, of medium thickness, chamber very elongate, occupying the whole of central portion of gall and tapering to a point at each end.

♀. Coccid bright orange-yellow, with the central portion of head segment on upper side vitreous. Length 6 lines, diameter at widest 2 lines. Upper side: head segment rounded in front, rather straighter behind, covered with short stout hairs, in the centre a circular depression containing a cluster of short fine hairs, an elongate oval ring of ferruginous round depressed spots, six in front, four behind; thoracic segments regular, distinct, covered with scattered fine short bristles, with much longer hairs on the apical margins, much more numerous on the last segment. Abdominal segments all clothed with long scattered white hairs, 1st segment with several short ferruginous spines in centre of back, 2nd to 4th segments with a double irregular row or patch of similar spines, 5th and 6th with a much thicker mass of stouter and longer spines; base of anal appendages ferruginous, covered with similar spines and scattered long hairs; anal appendages ferruginous at base, the rest black, long, slender, cylindrical, rugose, hairy, and lying close to each other from base to apex, truncate and slightly opened out at tip. Underside: a pair of black marks on either side of frontal fold, which look like eye spots; lobe bearing forelegs rounded in front and behind. Forelegs short and stout, ochreous; tibiæ stout, curved; tarsal claws black at tips, pointed and curved inwards; the middle and hind legs rather longer than forelegs. A rounded peg-like appendage, at the tip of which is the mouth, between the front pair of legs, all the underside and legs smooth and shining, with a few short scattered hairs all over, showing long and thick on the outer edges, anal segment hairy, with a patch of fine bright golden-yellow hairs at base of anal appendages.

It will be seen by the above description that this coccid differs very considerably from any of the previously described species, the curious depression and surrounding ring of spots being quite unique, while the supposed eye spots and the distinct projecting mouth are very remarkable. The coccid is very active, moving backwards and forwards with great ease in its long chamber; when laid on its back under the lens it is seen to turn the abdominal segments straight up and remain in this position all the time, resting only on the head and thoracic segments. This coccid seems to secrete hardly any of the floury matter exuded so plentifully by most species.

Hab.—Cobar, N.S.W. On *Eucalyptus* sp. (Mr. A. Roxburgh).

OPISTHOSCELIS VERRUCULA, n.sp. (Pl. XVII. figs. 3-5).

♀. Galls rounded green pea-shaped excrescences, slightly corrugated on the sides, sometimes nipple-shaped, growing singly or in scattered groups of two or three on the same leaf as the male galls; opening small and irregular on the underside of leaf; chamber an irregular oval cavity with wall of chamber thickest on summit; height 3½ lines, diameter 2½ lines.

♀. Coccid (first stage) flattish, elongate-oval, tapering towards the tip of abdomen, pale salmon pink, antennæ stout, short, conical, apparently 3-jointed, inserted in front of the eyes, the latter round and black. Midlegs rudimentary, but no signs of forelegs; posterior pair with stout femora and tibiæ, and short blunt tarsal joint showing over sides of insect; anal ring and four incurved spines on the tip of the anal segment.

♀. Coccid (second stage) brownish-yellow, head and thoracic segments large, rounded; abdominal segments distinct, small and tapering to the tip; coccid attached to the roof of the gall by the mouth (which forms a rounded mass when detached), lying across the chamber, and not downwards as in *Brachyscelis.* No traces of eyes, forelegs, or antennæ; the second or middle pair of legs represented by two slight pointed excrescences; hind legs well developed, femora large, stout, tibia rather slender, tarsal joint cylindrical, slender, nearly as long as the whole coccid, truncate at tip; thoracic segments large; abdominal segments small, tapering to the tip, which is rounded; anal segment carrying an anal ring with four curved spines forming the tail.

♀. Coccid (adult) bright red; upper side flat, circular, slightly concave, covered with white down; underside of body wrinkled;

legs broken short, or with the tarsal joint withered up or wanting. The gall at this stage is dome-shaped above, with the basal orifice surrounded with a raised ring.

♂. Galls 1½ to 2 lines high, produced upon the leaf in wart-like excrescences, broadest at base, tapering to a truncate tip, with a key-hole or slit-like apical orifice, sometimes in clusters of two or three, but often on the younger leaves, forming the whole leaf into a solid fleshy mass of galls all confluent at the base, but opening out individually at the apex, tinted at the tips with pale pink and covered with a whitish bloom.

♂. Coccid pale red, with white opaline wings; enveloped in a larval sac before emergence. Antennæ long, tubular, composed of nine joints; 1st stout, truncate; 2nd very short, obconical; 3rd of about the same length but irregular in shape and rounded at base and apex; 4th-8th of a uniform length, constricted and rounded at apex; 9th about half the length, with a blunted tip. Head and antennæ covered with long hairs; dorsal eyes round and prominent, ventral eyes very close together; front of head square, rounded behind the eyes. Thorax smooth, shining, round, broadest in front; legs long, slender; tarsi simple; underside of thorax and legs covered with short hairs; wings large, granulated, showing rich opaline reflections; the longitudinal vein well back from the margin of the wing; the discoidal branch long, stout, rounded, forming an elongate oval in the centre of the wing; abdomen with first joint short, almost as broad at base as at thorax, the others tapering towards the apex, each irregularly corrugated; 2nd broad and stout; 3rd and 4th shorter; the rest longer and slender, tapering to the tip, the last forming a sharp lance-like tip, readily moved backwards and forwards when the insect is alive; the last two joints with the movable tip pale yellow.

Hab.—Napoleon Reef, near Bathurst, N.S.W., on *Eucalyptus* sp. (W. S. C. Ross and W. W. Froggatt). In consequence of the larger trees in the vicinity of the mine having been cut down for firewood, there was a fine growth of young foliage from the stumps admirably adapted for such insect attacks.

OPISTHOSCELIS MASKELLI, n.sp. (Pl. XVII. figs. 6-9).

♀. Gall 6 lines high, diameter 4 lines; basal portion dull green, apical portion brown; solid, broad, and squat at the base, cylindrical for the first two-thirds, then sharply constricted, often into a distinct rim, from which a conical pyriform brown cap springs, formed of several concentric rings ending in a truncate tip, with the apical orifice in the centre; orifice a very narrow elongate slit; chamber flask-shaped, walls very thick at base, thinning out towards apex, smooth and shining inside.

The immature galls very much more elongate, flask-shaped, narrow at base, swelling out in the centre and coming to a slender tip, pale green, with the apex often tinged with pink or brown: on the young branchlets, leaf-stalks, and sometimes upon the midrib of the leaf, often singly, sometimes covering all the foliage of the tree.

This gall is very variable in form, but the above description is of the typical and usual shape, the others being only local variations.

♀. Larva pale pink to salmon colour, filling up the cavity in mature galls at the apical opening. Head lobed in centre with a fine fringe of hairs between antennæ; antennæ short and stout, consisting of four (?) joints and terminating with several setæ, one much longer than the others; eyes black, well back in the head behind the base of the antennæ; body elongate-oval, pointed towards the tip of the abdomen, segments distinct, legs stout, a little stouter and more shield-shaped than in the larvæ of *O. subrotunda.*

♀. Coccid (first stage) yellow, 2 lines long; flat on the upper side, elongate, rounded at the top, tapering to the tip, attached to the bottom of the gall by the mouth, which is situated in the centre of the upper portion of the thoracic fold, and drawing out considerably when detached, but retracted when released; no signs of eyes or antennæ; fore and middle pairs of legs wanting, hind pair reddish-yellow, femora short, stout, tibia slender, tarsi long, slender, often as long as the whole coccid, truncate at the tip. Abdominal segments small, distinct, rounded on the outer margins and tapering towards the apex, anal tail short, rounded.

♀. Coccid (second stage): mature coccid bluish-grey, covered with whitish dust on the back ; 3 lines long, 2 lines in diameter; oval, convex on the upper side, all the underside attached to the floor of the gall, so closely that it is impossible to detach it without injuring the coccid ; abdominal segments much reduced and curved upwards ; legs black, distinct ; tibiæ and tarsi short, the tarsal joint slender, filiform, curling over the tip of the abdomen and pointing upward towards the apical orifice, the tail not visible. At this stage the galls generally contain numbers of live larvæ.

♂. Galls 2 lines high ; reddish-brown, broad at the base, tapering towards the tip, tubular, the rim at the apex produced into five little teeth surrounding the apical orifice, which is circular ; growing upon the leaves singly, sometimes in immense numbers, covering both sides of the leaves.

♂. Coccid reddish-pink, dorsal eyes large, black, globular, standing out, wide apart, just behind the antennæ ; the latter short, about thrice the width of the head, consisting of nine indistinct irregular joints, rather short, covered with scattered white hairs ; thorax broad, rounded in front ; abdomen bright red, the segments constricted at the base, tapering towards the tip, terminating in a lance-like pointed style ; legs long, slender, covered with long white hairs, thighs short, tarsal joints simple ; wings large, hyaline.

This is a very distinct and rather common gall in New South Wales. I have taken it at Maitland, Cooma, Newcastle, and from a dozen localities within a radius of twenty miles of Sydney. A constant locality is Flemington on *Eucalyptus siderophloia,* the large-leaved ironbark ; full grown in September.

I have great pleasure in dedicating this fine species to W. M. Maskell, Esq., of New Zealand.

OPISTHOSCELIS SPINOSA, n.sp. (Pl. XVI. figs. 10-12).

♀. Gall brown, 3 lines high, 3 lines in diameter at the base ; broad and round at the base, coming to a sharp thorn-like tip, in which is situated the minute circular apical orifice; walls of chamber thin; always formed upon the leaves, generally covering them with isolated galls, but sometimes so close together that they abort the leaves.

♀. Coccid (first stage) bright yellow, smooth, shining, elongate, top-shaped, with the anal segments tapering to a point; attached by the mouth to the floor of the gall chamber; fore and middle pairs of legs rudimentary, hind pair long and slender.

♀. Coccid (second stage) reddish-yellow, covered on the upper side with curly white hairs, interspersed with longer straighter hairs forming a fine fringe round the outer margin of the coccid; segments rounded, well defined, fringed on the lower margins with close long hairs, and forming a rounded tail at the tip of abdomen; underside rounded at the head, the outer portion of head and thoracic segments forming an overlapping rim; traces of rudimentary antennæ, fore and middle legs; hind legs stout, distinct, dull yellow blotched with black, tarsi excessively elongated, slender, cylindrical, truncate at the tip, and often twice the length of the coccid.

♀. Mature coccid fixed on the underside to the base of the gall in a similar manner to *O. Maskelli*, with the long tarsi curled up over its back and almost reaching to the extremity of the chamber.

♂. Galls green, ½ line high, 2 lines in diameter; rounded excrescences irregularly wrinkled on the summit, with an irregularly rounded basal orifice situated in a brownish wart on the underside of the leaf; galls clustered together on a leaf by themselves, but sometimes scattered about among the female galls.

♂. Coccid salmon-pink; head square in front, rounded behind, broader than long; dorsal eyes globular; antennæ long and stout; covered with long plumose hairs, the 1st joint short, cylindrical; 2nd obconical, short; 3rd cylindrical, longest; 4th-8th of uniform length; 9th short, rounded at tip: thorax broad, marked with reddish lines; legs very hairy; wings large, white, semitransparent, with a granulated appearance, the transverse and discoidal nervures broad well into the wing, with the latter turning upward towards the tip; abdomen with the first four segments stout, cylindrical; 5th-8th long, slender, tapering downwards; 9th long, slender, and truncate at the tip, from which springs out a tuft of slender white filaments, forming a very handsome brush.

Hab.—Plentiful in several localities about Sydney; common at Flemington on *E. siderophloia* in September (W. W. Froggatt).

OPISTHOSCELIS PISIFORMIS, n.sp. (Pl. XVII. figs. 13-14).

♀. Galls green, tinged with reddish-brown; soft globular excrescences 2 lines in diameter covering the leaves; basal orifice on the underside of the leaf, keyhole-shaped, in the centre of a raised brown button-like wart; chamber spherical, walls thin, the coccid lying across the roof lightly attached by the mouth to the gall.

Larva not differing from previously described species, of which *O. Maskelli* may be taken as the type.

♀. Coccid (first stage) pale yellow, almost a regular oval, looking very much like a small seed; with round dorsal eyes; underside short, conical; antennæ, fore and middle legs short, rudimentary, semitransparent; hind legs much more produced, with the tarsal joint long and cylindrical.

♀. Coccid (second stage) salmon-pink; head and thorax rounded, with the head lobe hanging forward, oval, with a small dark spot above it, much wrinkled; abdomen elongate, long and slender, the last segment forming a small conical tail, on the upper side of which are two short recurved reddish spines tipped with black; all covered on the upper side with long close hairs, forming a fringe on outer margins and also fringing the segments of the underside at the apical margins; legs long and slender, femora short and stout, tibiæ slender, of uniform thickness to the tip, the tarsal joint very long, slender and filiform.

♂. Galls conical, 2 lines high, brown; growing upon the leaves and young twigs, broadest at the base, tapering to the apex, which is truncate, with an irregular oval aperture; immature males in these cells pale red, swathed in thick white felty sacs.

♂. Unknown.

Hab.—Bathurst on *Eucalyptus melliodora;* Manly on *E. robusta;* Thornleigh on *E. piperita;* Sutherland on *E. resinifera* (Froggatt).

This is a very variable species, the galls also often differing much in shape and size, but I believe these are only local varieties of the same thing.

OPISTHOSCELIS MAMMULARIS, n.sp. (Pl. XVI. figs. 15-16).

♀. Gall 3½ lines high, 2 lines in diameter at the base; red to reddish-brown, tinged with green, broad at the base, constricted about two-thirds up and swelling out into a rounded nipple, upper portion of gall solid, walls thin on the sides, chamber small and irregular, basal orifice on underside of leaf, very irregular, on a reddish warty pustule.

♀. Coccid dull yellow, head and thoracic segments large, rounded, the abdominal segments very small and narrow, all covered with long curly white hairs, with other shorter straight ones forming a fringe round the anal segment, tip of anal segment bearing two small reddish-brown spines curved backwards, forming a tail; legs rather short.

♀. Coccid (mature) rounded, wrinkled, greyish-brown, tapering towards the anal tip: hind legs pale yellow; femora short, rounded; tibiæ long, stoutest at the base; tarsal joint long, filiform, three times as long as tibiæ, the apex not quite truncate as in the others, but coming to a point.

♂. Galls green, forming slightly raised lumps about 1 line in diameter, generally three or four galls forming in clusters, on the underside of the leaf forming conical funnel-shaped excrescences broadest at the base, truncate at the tip; orifice large, the inner margins of the opening crenulated and irregular.

♂. Coccid unknown.

Hab.—Bendigo, Vic., on *Eucalyptus* sp. (Froggatt).

OPISTHOSCELIS FIBULARIS, n.sp. (Pl. XVI. figs. 17-21).

♀. Gall brown, pyriform, growing upon the leaves, often in great numbers, 2 lines high, 2 lines in diameter, the base forming a circular ring, from which stands out a conical tapering thorn, slightly constricted below the apex, which is truncate; apical orifice a transverse slit-like opening, with the side of the tip curling downwards on either side like a small lip; walls of gall thin; female coccid slightly attached to the floor of the chamber.

♀. Coccid dull pale yellow; head and thoracic segments very round with the abdominal ones narrow, small and tapering to the anal extremity, covered with fine hairs thickly fringing the margins of the segments; underside flat; centre of head segment containing two irregular rounded black patches, which are joined on the inner edges to each other; in the front of each a small black tubercle like an aborted antenna, on the lower or apical portion of central or head segment, and just above the legs, is a small fold looking like a sketch of an anchor; legs long and slender, femora generally black, tibiæ short, tarsal joint slender, cylindrical, slightly tapered towards the tip, which is not truncate but bluntly rounded; abdominal segment closely covered with short hairs.

♂. Galls with the female galls on the upper side of the leaves, the base forming a red wart about ½ a line in length on underside of leaf, 1 line high, 1½ lines in diameter at base, broadest at base, tapering towards apex, apical orifice an elongate oval on upper side of leaf.

Hab.—Bendigo, on leaves of *Eucalyptus* sp. in September; Bathurst in February (Froggatt).

OPISTHOSCELIS MACULATA, n.sp. (Pl. XVII. figs. 22-23).

♀. Galls brown, 3 lines high, 2 lines in diameter at the base, ½ a line in diameter at the apex; pyriform, broad at base, tapering very slightly about two-thirds of height, then constricted into a conical point; apical orifice narrow, slit-like, with the lip on either side black, rugose and slightly turned back; base of gall thick; walls of chamber brown, shining, of medium thickness: upon the slender twigs and leaf-stalks sometimes singly but other times close together in rows.

♀. Coccid ochreous-yellow, shining and glassy, attached by the whole of the underside to the floor of the chamber, almost oval; segmental divisions distinct, with an impressed spot on either side of the first four segments; the abdominal segments small, tapering to the tail, fringed with scattered white hairs, the tip truncate, the tail hidden; tarsal joint of hind legs long and slender, tapering slightly towards the tip.

♂. Galls reddish-brown to black, 1½ lines high, broadest at the base, tubular, tapering towards the apex; apical orifice irregular, crenulated, the rim forming a number of irregular teeth; growing upon the leaves, and often in such numbers that the leaf is quite aborted.

The female galls are somewhat like a small variety of *O. Maskelli* at first sight, but the mature female (the only stage obtained) is quite distinct, while the galls, which are very plentiful in the Whipstick Scrub, do not vary in the slightest.

Hab.—Bendigo, Vic., on *E. leucoxylon* and on *E. gracilis* in August (Froggatt).

OPISTHOSCELIS SERRATA, n.sp. (Pl. XVII. figs. 24-26).

♀. Gall green tinged with yellow, spherical, 3 lines in diameter, constricted at the base; formed upon the leaves, generally singly but sometimes in groups of two or three; basal orifice on underside of leaf an irregular slit with rugose warty edges; gall soft and spongy, with the chamber large.

♀. Coccid pale yellow, elongate, rounded; head rounded in front and rising up in the middle between the eyes in a crescent; dorsal eyes globular, black, not on the edge but placed well in the side of head; outer margins of the thoracic and abdominal segments on upper side serrate, with an irregular row of fleshy teeth right round to the anal tip, the body swelling out underneath them so that they appear not to be the marginal edges until closely examined; abdominal segments lightly fringed with hairs; underside flattish. Antennæ ferruginous, springing out of the first fold, formed of four stout irregular cylindrical joints, the last rounded at the tip and surrounded with scattered hairs; head and thoracic segments very wrinkled, a deep angular brownish cavity is evidently the mouth, which is retracted when the coccid is removed from the gall; when in the gall it is attached to the roof of the chamber; short, cylindrical, 2-jointed fore and middle legs; hind legs ferruginous, femora short and stout, tibiæ stout, tarsal joint about twice the length of femora, tapering slightly to the tip, which is rather rounded and not truncate at the apex.

Hab.—Bendigo, Vic., on *Eucalyptus* sp. (Froggatt).

The galls of this species are very like those of *O. subrotunda*, but the remarkable well-developed antennæ and curious serrate edges of the segments make it very distinct from any other species I have examined.

EXPLANATION OF PLATES.

Brachyscelis umbellata, n.sp.

Fig. 1 (Pl. XVI.) —Female galls.
Fig. 2 (Pl. XVI.) —Female coccid, ventral view.

Opisthoscelis verrucula, n.sp.

Fig. 3 (Pl. XVII.)—Male and female galls.
Fig. 4 (Pl. XVII.)—Female coccid, ventral view.
Fig. 5 (Pl. XVII.)—Male coccid, ventral view.

O. Maskelli, n.sp.

Fig. 6 (Pl. XVII.)—Male and female galls.
Fig. 7 (Pl. XVII.)—Larva.
Fig. 8 (Pl. XVII.)—Female coccid, in first stage.
Fig. 9 (Pl. XVII.)—Female coccid, full grown.

O. spinosa, n.sp.

Fig. 10 (Pl. XVI.) —Male and female galls.
Fig. 11 (Pl. XVI.) —Female coccid, ventral view.
Fig. 12 (Pl. XVI.) —Male coccid, ventral view.

O. pisiformis, n.sp.

Fig. 13 (Pl. XVII.)—Male and female galls.
Fig. 14 (Pl. XVII.)—Female coccid, dorsal view.

O. mammularis, n.sp.

Fig. 15 (Pl. XVI.) —Male and female galls.
Fig. 16 (Pl. XVI.) —Female coccid, dorsal view.

O. fibularis, n.sp.

Fig. 17 (Pl. XVI.) —Male and female galls.
Fig. 18 (Pl. XVI.) —Female coccid, in first stage.
Fig. 19 (Pl. XVI.) —Female, in second stage.
Fig. 20 (Pl. XVI.) —Female, in third stage.
Fig. 21 (Pl. XVI.) —Larva.

O. maculata, n.sp.

Fig. 22 (Pl. XVII.)—Male and female galls.
Fig. 23 (Pl. XVII.)—Female coccid, full grown.

O. serrata, n.sp.

Fig. 24 (Pl. XVII.)—Female galls.
Fig. 25 (Pl. XVII.)—Female coccid, ventral view.
Fig. 26 (Pl. XVII.)—Female coccid, dorsal view.

ON THE RECENTLY OBSERVED EVIDENCES OF AN EXTENSIVE GLACIER ACTION AT MOUNT KOSCIUSKO PLATEAU.

By Richard Helms.

(Communicated by Professor T. W. E. David.)

(Plate xviii.)

> "Quod minimum est, minimum est; sed in minimum fidelium esse magnum est."

Whether Australia, or any portion of it, underwent a glacial period has for a number of years been a disputed question among geologists, and up to quite recently the evidences in favour of this conjecture have been so scanty, and were mainly based upon the occurrences of striated or polished (?) rocks, that it cannot be wondered at that the proofs of it were not considered conclusive. If such an astute observer as the late Rev. Tenison-Woods only a few years ago could declare, and probably justly so at the time, that the evidences of a glacial period were not reliable, it is not surprising that the subject remained a doubtful question so long.* It is also very plainly perceptible from the report to the Minister for Mines furnished by Dr. R. v. Lendenfeld after his visit to Mount Kosciusko during the early part of January, 1885,† that he based his suppositions entirely upon the glacier-worn rocks he maintained to have discovered near the base of this mountain and some distance further east.*

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* J. E. Tenison-Woods.—"Physical Structure and Geology of Australia," P.L.S.N.S.W. Vol. vii. 1882, p. 382. "There is no satisfactory evidence of any former participation in the great ice age by the Continent of Australia. One or two instances of grooves or striations are recorded, but, standing alone in so vast a territory, the ice origin is very doubtful. On the whole, the evidence afforded by the animal remains is decidedly in favour of a warmer climate for Australia than that which now prevails, and this is borne out by the plant remains."

† Report by Dr. R. von Lendenfeld on the results of his recent examination of the central part of the Australian Alps.

During my first visit to the Snowy Mountains (Feb., 1889) I carefully looked for striæ and polished surfaces on the rocks described by Dr. v. Lendenfeld, particularly in Wilkinson Valley, but could not agree with him that they retained such traces, although the general appearance when looked at from a distance favoured the theory that glaciers had ground them down, and that some of the valleys had undergone a prolonged glacial action. On none of the many solitary rocks and exposed rock-surfaces (except in one instance that will be referred to below) I examined then and since have I found *polished* surfaces, nor the characteristic striæ seen on most of the reliable *roches moutonnées.* If, however, the nature of the rock formation is taken into consideration, the absence of these features can scarcely be surprising, because its tendency to weather is so great that it forbids one to expect the retention of polish or striation for any length of time. I am of the opinion that, except where buried in moraine deposits, very few polished and striated rock fragments will be discovered in this district. The principal rock of the whole system of the Australian Alps is a gneisic granite, often rather coarsely crystallised and occasionally friable when exposed. This rock changes in many places into true gneiss, splendid illustrations of which are afforded in the beds of nearly all the tributaries of the Snowy River on the high elevations. These rocks occur everywhere on the highest portion of the Snowy Mountains except in one part (between Dividing Peak and Mt. Twynam), where slate overlies the granite and forms several secondary ranges. Neither of these rocks, it will be admitted, is very weather-resisting, nor can they withstand the erosive action of the atmosphere and the severe changes of temperature for a great length of time. In fact, in my opinion, a couple of centuries would almost suffice to completely obliterate all the unmistakable evidences, such as polish and striæ.

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* L.c. p. 10. Dr. R. von Lendenfeld says—"I have found no moraines in the district which might indicate that once glaciers existed there, but I have found rocks polished by glacial action in many places."

The only piece of rock I have seen that has retained its polish I found about a mile and a quarter to the north of Mt. Twynam on the southern side of a rugged peak surrounded by a number of rocks of various dimensions. The block is about four feet long and nearly square and lies with its polished surface upwards. About the third of one corner of the surface has split off and shows no polish, but the remainder is polished perfectly level, but still shows a number of shallow pits where the polish did not reach the original fracture-surface. The rock of this piece is a very quartzose granite (syenite?) quite dissimilar from the prevailing rock, and evidently much harder, which accounts for the retention of the polish. There are, however, no striæ noticeable, which is rather remarkable, as they are generally present on glacier-polished surfaces. The beautifully striated and polished specimens of quartzite from the head of St. Vincent Gulf I saw in the possession of Prof. Ralph Tate at the University of Adelaide are without doubt most characteristic examples of glaciated rocks, and surpass all that have so far been found in the Australian Alps.

To what erroneous conclusions careless and superficial observations may lead one I have had the opportunity of judging during my recent visit to these mountains.*

Dr. R. v. Lendenfeld in "The Glacial Period of Australia"† says: "Further proofs for the correctness of the supposition that we have to do with the effects of ice are furnished by the relative position of joints and surface. The polishing goes on of course quite regardless of joints, and consequently in ninety-nine cases out of a hundred one will find the polished surface cutting the joints at varying angles, and not parallel to the direction of any joints."

This very feasible-looking supposition is, however, entirely inapplicable to the rocks of the Australian Alps, where I found a number of recent fractures going crosswise in almost every direction imaginable to the joints, which, surprising as it is, seems almost as frequent as the splitting with the joints. The pieces so split, moreover, show generally a very even surface, which adds to the appearance as if they had been ground level. One cannot, however, mistake such fractures if they are carefully examined. Besides, very frequently both planes are found in close proximity, and being still free from any growth of lichens it proves their recent separation. The most remarkable boulder met with by me may be described as follows. The two faces of it are perfectly level and meet at an angle of about 140° and therefore cross the same joints in two directions. On first approaching this remarkable specimen I felt delighted, thinking that I had met with a unique glaciated block; when, however, on close examination, I could not discover any traces of polish or striæ I came to the conclusion that the shape of the boulder was attributable rather to extraordinary fractures than to glaciation. I am the more inclined to this belief because the specimen is comparatively rich in quartz, and therefore should have resisted erosion better than many of the other boulders met everywhere.*

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* February, 1893.

† P.L.S.N.S.W. x. p. 48.

So much for the glacier-polished rocks, which are certainly extremely rare in these regions. However, in the light of evidence I am able to bring forward, it is quite justifiable to assume that many of the rounded, concave, and level surfaces found upon a number of the large rock-facings have been produced by glacier action, *although the minute features of it* have long since been destroyed by erosion and decomposition.

From the discovery by me of a number of terminal moraines it can no longer be doubted that during a certain period the whole of the Kosciusko Plateau† was covered with ice, and that the little differences in height at present found between the valleys and most of the ranges are to a great extent due to the levelling action of glaciers.

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* The block lies some distance up the south-eastern side of the "Dividing Peak."

† In the strict sense of the word this term is perhaps not applicable, but I have adopted it for convenience' sake. It is a gradually rising highland, with mostly gently sloping and low ranges.

Many of the valleys are flat at the bottom and filled with rock débris, which is exposed to observation wherever a watercourse passes through them. Extensive flats occur in places, with large rocks sticking out of the surface here and there and bogs all over them. These flats have all been formed by ice, and the bogs in them are the result of deficient drainage owing to the blocking of the natural incline by remnants of terminal moraines. Some of these terminal moraines are well-defined, and the packing of the boulders near them frequently plainly visible. All the moraines observed by me end towards the east or south-east; at any rate it is plainly demonstrable that the ice moved from a westerly direction. It is reasonable to presume that in former ages as now the westerly winds predominated in these regions, and probably were the strongest as well. In consequence of this, great masses of fallen snow would be blown in an easterly direction and heaped up on the eastern slopes of the ranges, where the greater accumulation of it would be the means of forming more massive, and consequently longer lasting, glaciers than on the western slopes.

To the west of the Snowy Mountains the valleys are very deep and the ranges much steeper than on the eastern side; on account of this it may be more difficult to trace the glacier action in that direction, nor may they ever have assumed here such proportions as on the other side. There is, however, plenty of scope to discover evidences particularly at the lower end of Wilkinson Valley and to the south-west of Mount Townsend, as well as near the lakes to the south of it.

It appears that the ice-streams taking an easterly direction precipitated into the Crackenback Valley at almost every break in the Ramshead Range, and wherever this took place terminal moraines more or less distinct are to be found. Such at least is the aspect of it as presented to the observer at the present time, which almost leaves the impression of the glaciation having been confined to the highest portion of the ranges. It was not possible for me to visit all these interesting spots, but a great number I have more or less closely examined, and with the help of the accompanying map (Pl. XVIII.) I shall be enabled to point out and describe some of the most interesting and conspicuous features of glaciation that have come under my observation.

After crossing the Crackenback River a short distance above its junction with the Snowy River the track begins to lead steadily upwards till it reaches the foot of a mountain spur. The ascent of this is steep in many places and the top of it about 4500 feet above sea-level. From here the ascent becomes again more gradual, and continuing for about a mile Wilson Valley is reached, and an open grassy flat shows up to the right. This may safely be considered attributable to glacier action, and probably a few smaller flats met with previously owe their origin to the same cause. Above this flat the valley narrows considerably between the steep ranges on both sides for some distance, when it again widens out. Here terrace-like several boulder packings cross it at intervals, through which the descending rivulet is seeking its course in a sinuous line. Ascending further the valley expands into a large flat that faces the eye with a distinct terminal moraine, the fan-like expansions of which slope down the valley. Entering the flat we stand on Boggy Plain and upon an unmistakable glacier deposit, that covers with all its ramifications more than a square mile at an elevation of about 5200 feet above the sea. Surrounded by elevated ground, and on account of its raised termination towards Wilson's Valley this plain is in many places very boggy, which is a characteristic feature of nearly all the plains and flat valleys among these ranges, and has been alluded to above.

Proceeding onward, the evidences of ice-action become more plentiful at almost every turn, and scarcely a valley is crossed that does not testify to this formation. Very pronounced it appears again on the flat about a quarter of a mile from Pretty Point. This flat is strewn with boulders partly embedded in the smaller débris of various kinds of rock and gritty soil, and ends, in an easterly direction, towards the Crackenback River, with a fan-like expansion down the side of its valley.

Just below the rise that leads to Pretty Point a small flat occurs similar in nature to the last described, ending also, in a southerly direction, at the margin of the Crackenback Valley, near the place where it makes a turn. In this locality enormous blocks of granite have been pushed over the declivity. One of these erratics, weighing several hundred tons, rests on divers others high enough from the ground to allow a man to pass underneath. These characteristics leave the impression as if at one time the ice had passed over the short range that runs northwestwards from Pretty Point.

The height of Pretty Point close by is about 5780 feet above the sea, and from here the ground has a gentle slope of about half a mile to the west as far as Thompson Plain, which, extending for about a mile in a S.E. to N.W. direction, expands to a third of a mile in width. This portion of the "plateau," which has now been reached, is very interesting regarding its glacification, for here evidently a large portion of the leading ice-stream pushed its way in a southerly direction, splitting, so to say, against the north-western portion of the spur that branches off from the short range at Pretty Point. At the south-eastern end of this branch, where it precipitates over the declivity of the Crackenback Valley, a vast bedding of boulders has been formed, the remarkably close packing of which reminded me of the pack-ice when a block occurs during the ice-flow in the northern European rivers. At the northern end of this branch probably the largest of any of the flat valleys found on the "plateau" runs east and westerly for nearly two and a half miles, and at one time no doubt carried one of the most continuous ice-streams that stretched across the valley to the north of Pretty Point as far as the Crackenback, as well as in the direction of Boggy Plain and Wilson Valley. Not far from the junction of Thompson Plain and higher up, particularly on its northern side, various massive granite facings bear still the marks of the gouging action of the ice in their concaved and deflexed surfaces, which are otherwise, however, much eroded.

Prior to the time when the bifurcation took place the glacier must have been considerably more massive and undoubtedly swept over the rise at Pretty Point. This is plainly demonstrated by the features met to the east and south-east of this elevation, and has been already referred to. The interest involved in this is that the ice-cap of the plateau must have been so enormous that its limit could not well be brought within its confines, but must have extended over a far greater area, for which, however, I am not at present in a position to bring forward positive proof.

All other features and indications met with on the plateau could well be explained as having originated from local glaciation.

The terminal moraines formed as the glaciers gradually receded to the highest elevation will no doubt be met with in many more localities than I was able to visit during my short stay in the mountains. Those seen by me are marked on the map and need no further description, excepting those I found close to one of the highest peaks, which surpass all others in their perfect preservation and unique formation.

At the base of Mt. Twynam and in the valley to the south of the Crummer Range, between this and the branch range that runs out from the slate cap in an easterly direction towards the Snowy River, these distinct and unmistakable evidences of glacier action have been preserved. It seems almost as if the configurations of the neighbouring mountains and ridges had been specially designed for the purpose of retaining these evidences, and probably no other locality in any part of the world can be found where within so limited a space such a number of various evidences testify to the former existence of ice, and prove the wonderful changes it has made on the face of the earth.

The small snow-fields hanging on the ledges and in the clefts of the south-eastern declivities of Mt. Twynam faintly indicate still how ages ago the snow piled up here and, transformed into masses of solid ice, worked its way downward. This snow at the present day never entirely disappears, and, though it only granulates and is no longer transformed into ice, may be regarded as the last remnant of former glacier formation. The pure liquid oozing out from under it flows down the sides and ledges of the rocks and leaps in numerous waterfalls over a surface that for many thousand years did not see daylight, when it was covered by a massive layer of ice. At the foot of the range the water feeds a lake,* that now reflects the azure of the sky, but darkened with greater intensity on account of its depth, having its placid surface exposed to the gay sunlight that for eons of time was hidden in darkness by the rigid cover that slid high above it slowly into the valley below. It remained a solid block of ice long after the sliding glaciers had ceased passing over it, and their abrading action stopped depositing the débris below and around it. Thus it rested; but now this eye in the Alpine landscape does not always reproduce the surrounding cliffs on a smooth surface. The waterfowl disporting themselves upon it sometimes ripple the water, and when the searching gales which frequently sweep the neighbouring heights reach this sheltered position it may even be agitated into waves.

To the south-east of this lake an extraordinary and almost unique feature is met with, of which but few similar and none else so perfect exist.

The peculiar formation cannot be better described than by calling it a moraine-dam, because it resembles an artificially heaped up railway embankment more than anything else I know of. Running in an almost E.N.E. and W.S.W. direction, it extends for about a third of a mile in a straight line, with even scarps on both sides, and has a flat top, which is about half a chain wide. At its eastern side it leans against a granite outcrop, and towards the west it finishes with a spreading talus just as if truck loads of stuff had been tipped over in that direction. It is in places upwards of a hundred feet higher than the valley it forms with the adjoining secondary and portion of the Main Range, and is entirely composed of granite and slate fragments mixed with earth.

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* Lake Merewether. Named by me in honour of the worthy president of the N.S.W. branch of the R. Geog. Soc.

How this extraordinary feature was formed and placed in such a remarkable position—for it forms, so to say, a ridge in the centre of a valley—is a very perplexing question to answer. After carefully scrutinising its surroundings, however, I have formulated a theory which I think will explain its origin.

The granite outcrop at its eastern end played no doubt an important part towards its origination. I presume that when the glacier field became reduced to glacier streams, and these so far receded that they only filled the valleys, and the deposition of débris began within their limits, was the time when this strange moraine-dam started to form. The glacier coming over the top of Mt. Twynam down the valley was evidently jammed by the granite outcrop and piled up between this protrusion and the southern branch of the Crummer Range.* Thus blocked, the ice-current must have progressed rather slower at the base than on top when this portion passed over the obstructing granite protrusion. The upper stratum of the ice, although following on the whole the general direction of the lower one, would naturally expand in a lateral direction, where it was not impeded, and constantly crumbling away and likely dropping down some distance, it must have deposited the débris of rock it carried with it in this marvellously evenly shaped configuration. Whilst I see things seemingly clearly enough in my mind's eye, and can picture to myself the locality and its environs, I must admit that it baffles me to offer in words the graphic delineation that is necessary to correctly impart my meaning. I hope, however, that at least to some extent I have been lucid enough to convey an idea of this marvel.†

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* Named by me in honour of my friend Mr. H. S. W. Crummer, the worthy and indefatigable treasurer of Royal Geog. Soc. in Sydney.

† Two more such singularly formed moraine-dams were observed by me, but none of them can be compared as to the regularity of their shapes to the one near Lake Merewether. One of these is situated at the southern side of the low saddle in the Main Range, not far from the "Dividing Peak," and the other can be found near the lower side of the Etheridge Range (named after Robert Etheridge, jun., Palæontologist), a secondary range that runs almost parallel to the Main Range near Mt. Townsend. Both places are marked on the map.

Not more than a few hundred yards below the eastern end of this moraine-dam a moraine of the general type expands over the whole width of the valley and fills it to nearly where it is crossed by the Snowy River. Rising crescent-shaped, with an even sweep and moderately declining talus upwards of twenty to twenty-five feet above the valley, it is about a quarter of a mile wide and probably half a mile long. Heavy granite boulders of all sizes lie piled up together, intermixed in places with some of slate. Irregularly deposited as they are, they form a more or less evenly directed incline, with some of the largest rock masses protruding above it. The whole spreads in the distinctive fan-like shape and diverging ridges, and wedges out at the lower end. Low shrub vegetation covers it here and there, particularly at the upper end and where the interstices are filled up; grass hides the stones, but a great many patches are still nude and probably have not altered much in appearance since first the rubble was left there, except perhaps that weathering has rounded the surfaces of the boulders, which is specially noticeable with the slate fragments. A shallow lake at its upper end has found an outlet through these rubble masses and discharges its water meanderingly through them into the infant waves of the Snowy River below. This lake is not above a few feet deep in the centre, and its origin is simply the effect of the moraine below it having dammed the valley; consequently it was the result of ice action, but in a different way from that in which Lake Merewether was formed.

My examinations can by no means be considered exhaustive even as far as the plateau is concerned, and no doubt many more interesting features are likely to be found upon it. Besides that, there is nearly the whole of the western side of the Main Range and its extent as far as Kiandra (nearly 50 miles), so to say, scientifically unexplored, and offering an extensive field for further investigation. No doubt at the western side of the highest peaks the most favourable locality exists for new discoveries. The only moraine deposit I have examined on the western side is the small peninsula that almost divides Lake Albina. This lake owes its origin mainly to the fact that the valley below it has been filled to some extent with rock fragments and large blocks, probably brought there through the action of glacier currents, but the declivities of the enclosing ranges are steep enough to allow the deposition to be attributed to landslips. However, ice-action has originated the moraine in the lake, and therefore the filling of the valley is likely, to some extent at any rate, due to the same cause.

Into the very height of summer some snow-fields remain on the eastern side of the Main Range, and a few never entirely disappear. The general extent of the deposits is indicated by the total absence of all vegetation, and their area is therefore easily traced by a fringe of verdure. Most of them disappear rapidly towards the end of February, and those that do not vanish entirely are by that time reduced to their minimum extent. It depends both upon the greater or lesser quantity of snow-drifts during the winter as well as upon the higher or lower average temperature whether these snow-fields disappear earlier or later. Those nestling on the precipitous declivities below the peaks of Mt. Kosciusko and Mt. Twynam are perhaps the only ones that never entirely disappear even in the hottest summers, and it may safely be said that they remain permanent over a limited area. The conditions are most favourable for the retention of snow in these places, the elevation for one thing, as well as the fact that the rugged peaks furnish many clefts for the accumulation of it and that the spots are only touched by the solar rays during the early part of the day when they do not furnish much heat, combine to prevent as rapid a melting in these places as elsewhere.

During my late visit I found snow in many more places remaining at the end of February than I noticed on my previous visit in 1889. This must be entirely attributable to the prevailing cool weather during the last summer, because I was informed that the snow-fall had been much lighter than usual during the preceding winter.* This year the winter set in very early on these heights. Already the middle of February began to get cold. At an elevation of 5500 feet near Pretty Point my min. therm. registered: Feb. 20, 31° F.; Feb. 21, 26°; Feb. 22, 33·5°; and the max. therm. 45·5°, 54°, and 53° respectively on those dates. Although this cold wave was replaced again by warmer weather for a few days, the temperature soon went down again, and winter, it may be said, had begun to set in. This is rather an exceptionally early time for it; as a rule the weather remains mild till the middle of March.

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* There was even snow left in the shaded clefts just above Lake Merewether between 600 and 700 feet below the summit of Mt. Twynam.

In connection with the snow-fields I am able to record the interesting occurrence of "red snow," which, as far as I am aware, has previously not been observed in the southern hemisphere, certainly not in Australia.

On nearly all the patches of snow I visited a large portion of their surface was noticed to be of a dirty red colour. The dirty appearance was caused by dust, as generally is found upon melting snow, but the red on examination proved to be a minute alga that singly has an intense colour like dark blood. Whether it is identical with the *Protococcus nivalis* of the Arctic regions I am unfortunately unable to prove, because I could not preserve the organisms for microscopic examination, but if not identical it is likely that the Australian plant is closely allied to it. That, however, the colouring matter is an alga and not caused by any other substance the simple lens sufficiently attests. These algæ live most luxuriantly and very abundantly a few inches below the surface, and when the dirty granulated crust of the snow is removed to the depth of an inch or two the sight is surprising and pleasing. The disclosed part reveals a beautifully fresh crimson colouring speckled with pure white snow granules, that resembles the hue of a freshly cut ripe watermelon.

These observations, that were made by me whilst staying but a short period in the Australian Alps, during which time the fogs and the rainy weather frequently prevented my leaving the camp, I wish only to be considered as a record of such, and regret that my limited experience and insufficient knowledge of geology prevent me to attach a speculative opinion to them regarding the age during which the glaciation of these mountains occurred.

From what I have seen I must confess that it appears as if this region underwent a glacier period within its own limits and that the cessation of it dates not very far back. The evidences are very striking and abundant, and considering the perfect boundary of the moraines near the base of Mt. Twynam, extensively described above and carefully delineated upon the map, it is my opinion that here the last of the glaciers existed, when the ice-cap that probably covered the whole area of the plateau became separated into independent ice-streams. If Australia participated in a great southern glaciation, to which opinions, after other recent discoveries, seem to tend more than ever, it is but natural that the highest parts of it should have retained the ice longest, and considering that even now the summer heat is not sufficient to remove all the accumulating snow completely, the reduction of the glaciers must have been extraordinarily slow, although the highest peaks of the Snowy Mountains rise but little over 7000 feet above the sea.

What surprises me not a little is the fact that several eminent men who visited these mountains, and passed almost over exactly the same track as I did, should have overlooked the proofs that lay so manifestly plain below their feet. The many doubts that had been thrown upon the probability of glacier traces existing in Australia, together with the positive assertion by one geologist that he had not found any moraines, whilst he must have walked over nearly a dozen of them, prevented me from making some of the statements contained in this paper known four years ago, after my first visit to Mt. Kosciusko. I was always desirous to revisit these localities to convince myself of the correctness of the opinion formed at that time, which recently I have more than fully accomplished.

The occurrence of gold at the bottom of the glacier deposits on the eastern end of the plateau and beyond it is noteworthy. Fairly payable patches were found along Piper's Creek and Digger's Creek. At both these places a few parties were working still, and during the last ten years some miners have from time to time worked in these localities. At Boggy Plain a party was prospecting during my last stay, and had obtained particles of gold in several holes they had sunk. But the gold is everywhere very thinly distributed and at the best "patchy"; no defined leads have been found, which from the nature of the deposit could scarcely be expected. From one of the miners, who had worked for several years at Kiandra, I heard that the gold-washes in that district were similar to those at Digger's Creek, at the upper end of which he was working at the time of my visit. If this information is correct it is probable that the Kiandra gold-field may have received its gold through ice-formation as well; this would form an interesting subject for closer investigation.

I have alluded to a probability of a greater extension of the glaciation than most of the described evidences indicate, for the proof of which I can, however, not bring forward any distinct evidences. The indication that, prior to the division of the ice-stream which filled to some extent the valleys to the west of Pretty Point, a larger glacier passed over the height of this place has already been noticed, and I now will briefly refer to what seems to me furthermore corroborative of this opinion.

To the south of the upper Crackenback River is a plain called the "Big Boggy Plain," and to the west of the Eucumbine River the "Snowy Plain" is situated; both are at an elevated position. Although I had no opportunity to visit these localities, from the description I have received of the character of the plains there is no doubt left in my mind that they owe their origin to ice-formation.

A very suggestive place I crossed on horseback is the "Rocky Plain" at the upper watershed of the Eucumbine. This is nearly 4000 feet above sea-level, and was, it is likely, formed by ice-action, and much of its surrounding country and its neighbouring levelled portions tend to confirm this hypothesis.

There are, however, indications observable at a lower level (but still about 3000 feet above the sea), which on closer examination may prove to be evidences of glaciation. These I simply passed over or by, during my coaching trips in the Monaro district, and therefore merely record them, without being able to comment upon their more minute nature.

The localities I allude to are: the grassy flats of the Mowamba Valley; the plain near Berridale*; the flats near Adaminaby, more particularly when the road from Cooma is taken, *viâ* Middlingbank; and in several places on the road from Cooma to Bombala, *viâ* Nimitybelle.

The Monaro district is to a great extent undulating country, traversed by several of the more prominent offshoots of the Australian Alps, and abounding everywhere in more or less extensive plains. On many of these lakes are found of various dimensions, mostly of a circular shape, the larger of which carry water permanently, whilst the smaller generally dry up during protracted rainless seasons.

Although time did not permit me to make closer observations, from what I saw during my flying passage over the places mentioned I was much impressed with their appearance, and the opinion gained ground in me that some of the features noticed might be the means of proving a more extensive glaciation than undoubtedly existed on the Kosciusko Plateau.

Regarding certain names on the highest ranges some differences exist between the geographers that first named the heights, &c., and the application of these names by later visitors. To obviate further mistakes I have attached the initials of the authorities to the names on the map: a new departure in map-making, but necessitated on account of the existing confusion.

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* A remarkable conglomerate formation occurs in a place near the Cooma-Berridale road not far from a lake, which, like all the other features, received only a passing glance from me.

ON *POLYCERCUS*: A PROLIFERATING CYSTIC PARASITE OF THE EARTHWORMS.

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(Plates XIX.-XX.)

The name *Polycercus* was proposed in 1883 by Villot* for a remarkable cystic worm described in 1868 by Mecznikoff.† The parasite in question was discovered by the latter at Odessa in specimens of *Lumbricus terrestris*, and does not seem to have been re-investigated since, the accounts of it and the comments on its affinities given by Moniez,‡ Leuckart,§ and Villot being all based on Mecznikoff's observations and figures.

A form exhibiting unmistakable affinities with Mecznikoff's has been found by us in a considerable proportion of specimens of an earthworm (*Didymogaster sylvatica*, Fletcher) common under stones and dead timber in certain parts of New South Wales; and an investigation of its structure and development has revealed features of some importance, which, so far as we have been enabled to ascertain, have not been previously noticed.

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* "Mémoire sur les cystiques des Ténias." Ann. des Sci. Nat. Zool. 6me série, Tome xv. (1883).

† Verhandlungen der Petersburger Naturf. Versammlung, Zool. pp. 263-266.

‡ "Essai Monographique sur les Cysticerques." Trav. de l'Inst. Zool. de Lille, Tome iii. (1880). I have to thank Professor Giard for his kindness in sending me a copy of this work, as well as one of the "Recherches sur les Ténias" by the same author.—W.A.H.

§ "Die Menschlichen Parasiten."

Numerous attempts were made to develop the adult tape-worm by feeding cats, a bandicoot, pigeons, gulls, fowls, and lizards with the cysts; but no Tænia was found that could be assigned to the species under investigation.

The infested earthworms (Pl. XIX. fig. 1) usually contain immense numbers of cysts, the largest of which are about a millimetre in diameter, adhering in clusters to the outer surface of the alimentary canal. Each cyst (fig. 2) contains in its interior a number—usually eight to twelve, sometimes as many as thirty—of fully-formed Cysticercoids, with, sometimes, a few in early stages of development. In many cases the cavity of the cyst in the interstices between the Cysticercoids is filled with blood, showing that the cyst has been formed rather in the wall of the dorsal blood-vessel or one of its main branches than in the wall of the alimentary canal, and that there has been a communication (afterwards sometimes found to be persistent and distinguishable in sections) between the lumen of the vessel and the cavity of the cyst. A few cysts were found which contained only the earlier stages and no fully developed Cysticercoids. Nothing was seen of hooked embryos.

In the earliest stage observed the cyst contained a solid spheroidal mass of soft small-celled tissue, which was not connected in any way with the cyst-wall. The latter was mainly, if not entirely, of the character of an adventitious cyst: if any part of it had been developed from the hooked embryo, it was no longer distinguishable. In the next stage the mass had lost its former spheroidal form owing to its having become drawn out into several lobes. The lobed mass then develops a number of buds. These are at first very small blunt processes (fig. 3). Gradually they become larger (figs. 4 and 5) and assume a rounded shape, broader distally than proximally, where there is a slight constriction. As they increase in size they assume an oval form and become constricted off from the parent mass, remaining attached to it only by an isthmus or stalk (fig. 6), which in the largest becomes very narrow. Up to this point the bud has consisted of a nearly uniform mass of small cells with only slight indications of division into an outer stratum and a central mass; but in sections these are found not to be sharply marked off from one another, the entire bud appearing as a mass of nearly uniform cells of small size. In the larger buds granules collect in the central mass, and a distinct hyaline cuticle becomes developed over the entire surface. The first trace of internal differentiation consists in the appearance in the interior, of a group of long and narrow cells (fig. 7), which lie parallel with one another in such a way as to form a circlet; these are the cells destined to form the hooks of the rostellum. At this stage vacuoles have appeared among the cells, but there is no regular cavity; a definite cavity first appears in the next stage, when the hooks have become developed.

In the next stage observed the hooks characteristic of the fully-formed Cysticercoid had appeared in the interior of the still solid mass of cells constituting the bud. Up to this point the calcareous corpuscles are not developed, and there is no trace of histological differentiation.

The next stage found is separated by a somewhat wide hiatus from that last described; but we have hitherto failed, in the many hundreds of specimens examined, to find any intermediate conditions. The calcareous corpuscles have now become formed in the outer layers of the developing Cysticercoid, and histological differentiation is well advanced. A cavity has appeared in the interior, so situated as to separate a distal, comparatively thin, wall from a proximal thick wall, on the middle of which is an inwardly projecting process—the rostellum—with a double circlet of hooks. On each side of this process on the inner surface of the proximal part of the wall are the rudiments of two of the suckers. The rostellum is at this stage entirely unconnected distally with the wall of the cysticercoid: it is capable of being to some extent invaginated within the posterior part of the rudimentary head.

The next stages (Pl. xix. fig. 9, and Pl. xx. figs. 1-3) show the rostellum more completely developed and now capable of being entirely invaginated within the posterior part of the head, which has become developed as an elevation of the proximal wall with the suckers on its sides. The distal end of the rostellum is still quite free; along the distal edges of the sheath (fig. 2) which invests it are a number of extremely fine spinules, which may have to do with the subsequent establishment of the connection between the rostellum and the distal wall. Opposite the free end of the rostellum is a small rounded aperture perforating the distal wall of the Cysticercoid.

The next stage observed was that of the fully-formed Cysticercoid. When this is in the retracted condition (Pl. xx. fig. 4) it is an oval body with a depression at the proximal, and a rounded aperture at the distal, end. In the interior is the more or less folded rostellum and the suckers. Running from the distal end of the rostellum to the aperture is a strand, which is the sheath of the rostellum, now become firmly connected with the edges of the opening. The body wall consists of two layers, which are continuous with one another anteriorly.

Occasionally, especially if the temperature is slightly raised, the rostellum becomes protruded through the aperture (fig. 6), and a continuation of this process results in the complete protrusion of the scolex (fig. 7)—the uninverted outer layer of the wall of the Cysticercoid remaining attached to its proximal (posterior) end as the caudal vesicle, while the inverted inner layer forms the body.

One of the most remarkable features of this Cysticercoid is the great length of the rostellum, which is nearly equal to the entire length of the inverted scolex (·25 to ·3 mm.). It is narrow (about ·06 mm.) and cylindrical in form, expanded distally to form the expansion to which the hooks are attached.

The shape of this terminal enlargement varies a little in different individuals; its breadth averages ·1 mm. The hooks (fig. 5) are arranged in two alternative circlets situated close together; they are about forty in number altogether, and their length is ·035 mm. Each has two roots, one longer, anterior, in line with the free part, the other shorter, internal, nearly at right angles to the main axis.

The rostellum (figs. 8 and 9) consists of a stiffish cellular rod enclosed in a sheath and dilated terminally. The substance of the cellular rod, the size of which is subject to considerable variation, consists of vacuolated cells not unlike notochordal cells; at the anterior extremity is a mass of denser cells. Enclosing the vacuolated cells are two thin layers of muscular fibres, the fibres of the internal layer circularly disposed and those of the external layer longitudinally. Enclosing the rostellum in the retracted condition is a layer of circularly arranged muscular fibres, and outside of all a thin cuticular sheath, from which the rostellum becomes protruded when it is evaginated.

Below the cuticle in the posterior part of the head and body is a layer of circularly-arranged muscular fibres. The layer of vertically-elongated subcuticular cells characteristic of most Cestodes is not developed. The muscular fibres of the suckers are recognisable though not completely differentiated.

In some of the specimens the excretory system was to be clearly distinguished. A depression in the middle of the posterior border leading into a small cavity with very definite walls lined by a continuation of the surface cuticle, is probably the external opening of the system, though the vessels were not traced to this point. A circular vessel surrounds the rostellum, and from this are given off four longitudinal vessels with numerous branches. The flame cells are numerous, situated superficially, each terminating a minute capillary vessel; the flames are ·0075 mm. in length.

In his "Menschliche Parasiten,"* Leuckart gives an account of the cystic worm found by Mecznikoff at Odessa in the body-cavity of the common earthworm. The paper† in which this is described, which is in Russian, not being accessible to us, we have had to depend upon the account of it given (with reproduction of some of the figures) by the great German zoologist in the work referred to, as well as upon the observations of Villot. The figures represent a form of Cysticercoid different from that now under consideration, and the account given of the development is not readily reconcilable with what we have found in the parasite of *Didymogaster.* We will quote here Leuckart's account in full:—

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* English translation by W. Hoyle, p. 366.

† Verhandlungen d. Petersburger Naturf. Versammlung, Zool. pp. 263-266 (1868).

"In its mature condition it consists of a thin-skined bladder, which contains a varying number (up to thirteen) of small Cysticerci of about 0·5 mm. in diameter."

"Although the latter lie quite free in the interior and possess, like the ordinary Cysticercoids, the distinctive caudal bladder, they are of very unusual origin, inasmuch as, instead of developing directly from the six-hooked embryos, they arise by proliferation of the wall of the surrounding bladder. The bladder is thus the brood-capsule of the enclosed Cysticercoids and corresponds in some respects to the brood-capsule of the *Echinococcus,* or perhaps to a *Cœnurus*-bladder, and, like these, is undoubtedly to be referred to the six-hooked embryo. The first developmental stage observed by Mecznikoff appeared to be a solid ball of about 0·08 mm., with an unusually thick cuticular envelope and cellular contents. The latter subsequently became clear on attaining a diameter of 0·14 mm., when the embryo lies on the inner surface in the form of a cellular layer. Soon the buds begin to form, and that exclusively from the cellular wall, which becomes thicker at certain spots and sends little projections into the inner cavity. Although at first flat and connected by their broad bases with the cellular wall, the protuberances, as they grow larger, gradually detach themselves from the subjacent layer. This separation is facilitated by the development of a hollow space in the interior of the basal portion, so that after a time the bud is only connected with the mother-bladder by a thin filament. Finally this connection is destroyed, and the bud thus becomes an oval body lying freely in the interior. It then proceeds to undergo its further development. This is essentially the same as that which we have already (ob-)served in the buds situated inside the brood-capsule in the *Echinococci,* only that in this case not only head and neck are formed, but a third joint, consisting of a kind of caudal bladder.

All these parts are formed almost simultaneously, for the originally compressed and solid bud increases in length, then becomes hollow inside, and becomes jointed by the development of the hook-apparatus in front and a bladder-like expansion behind. When the suckers and hooks are completely developed, the anterior part of the body draws back into the caudal bladder by invagination of the neck, so that at the end of its development the worm has exactly the same position as we formerly observed in *Cysticercus arionis*."*

Mecznikoff thus, it would appear, describes the embryo as elongating and becoming divided into three parts, on the most anterior of which the hooks become formed, this anterior part *subsequently becoming invaginated*, with the suckers, into the posterior part or caudal bladder. This is totally at variance with what we have found to occur in the parasite of *Didymogaster*, and, taking into account certain resemblances between the two forms, we are inclined to think that it is erroneous. It is probable that, if our supposition is correct, the error arose from an attempt to reconcile the stages observed with the known developmental history of *Echinococcus*. As regards the earlier stages, Mecznikoff's figures A and B, as reproduced by Leuckart (fig. 213, p. 366), do not represent any stage that occurs in the parasite of *Didymogaster*, and it is difficult even to reconcile them with Leuckart's description. The former represents the wall of the cyst as raised up internally into three thickenings, and the latter shows three oval masses, developed from those thickenings, attached together by narrow strands, though no longer connected with the cyst wall.

Leuckart,† as already noticed, refers *Polycercus* to the type of *Echinococcus*, and so does Moniez.‡ From this view Villot§

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* L.c. pp. 366 and 367 : second German edition, pp. 464 and 465.

† *Tom. cit.* p. 366.

‡ "Essai Monographique sur les Cysticerques." Travaux de l'Instit. Zool. de Lille, T. iii. (1880).

§ "Mémoire sur les cystiques des Ténias." Ann. des Sci. Nat. Zool. 6me série, Tome xv. (1883).

strongly dissents, and the history of the development, as above described, shows that his conclusion was correct. Having, however, only Mecznikoff's statements to rely upon, he was necessarily led to some wrong deductions. Thus he describes the caudal vesicle as invaginated in the "blastogène," whereas, as we have seen, the latter is really represented by a cellular mass from which the Cysticercoids are developed by proliferation. His detailed comparison with *Echinococcus* is rendered inaccurate in several particulars by a similar cause; but in its main outlines appears to us to present the true view of the case. "Le Cystique du Lombric n'appartient pas au même groupe que l'Echinocoque, et il ne représente nullement dans son groupe le type de l'Echinocoque. L'intéressant parasite découvert par Mecznikoff est un Cystique monocéphale, monosomatique et polycerque. L'Echinocoque, au contraire, est un Cystique polycéphale, polysomatique et monocerque. Les ressemblances sur lesquelles on s'est fondé pour rattacher les deux formes à un seul et même genre se réduisent en définitive à de simples analogies qui ne portent pas sur des parties homologues."*

In the Cysticercoids hitherto described there are three main types as regards the form of the completed larva: (1) those in which there is a longer or shorter caudal appendage, containing a small cavity, but in which no caudal bladder is present; (2) those in which such a caudal appendage is present and a caudal bladder as well; (3) those in which the caudal appendage is absent, but in which there is a well-formed caudal bladder.

Of the first group we have an example, it would appear from Grassi and Rovelli's account, in the Cysticercoid of *Taenia elliptica.* In *T. murina*, apparently, we have an example of the second form, in which the opening of the investing caudal bladder closes up; while in *Cysticercus tenebrionis*, according to our interpretation of Stein's observations, we have an example of a similar form, in which the aperture persists. Examples of the third group are *Cysticercus arionis* and the Cysticercoid of *T. infundibuliformis* (according to Grassi and Rovelli's account of it). It is to this group likewise that *Polycercus* is referable, and also, we believe, Villot's *Staphylocystis.*

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* L.c. p. 34. It is to be remarked here that the description of *Echinococcus* as 'monocerque' is open to objection, the daughter-vesicles of that genus being the equivalents of the caudal vesicles of other Cestodes.

In many Cysticercoids it would appear that there is a progressive invagination of the anterior parts within those lying behind: the anterior part of the head is invaginated within the posterior part; the head is invaginated within the body and the body within the caudal bladder. This condition of things is clearly a secondary one, brought about in adaptation to special circumstances. The enclosure of the head within the body and caudal bladder doubtless subserves the protection of the former; while at the same time it doubtless permits of the passage of the parasite to that part of the alimentary canal of the host in which the adult Cestode is capable of living—the hooks and suckers not coming into play for purposes of attachment until the intestinal juice has had the effect of causing evagination of the head and rostellum.

In *Polycercus* this adaptation may be said to reach its furthest known limit. Here there is no invagination in the strict sense, but the parts of the Cysticercoid are actually developed one within the other, the head within the body and the body within the caudal bladder, and it is only subsequently, when the Cysticercoid is about to pass into the adult Cestode, that by a process of evagination these parts assume their normal and primitive relations to one another. Whether this condition is exceptional or the reverse it would be impossible to say in the present condition of our knowledge of the development of the Cysticercoids. That it occurs in another form we know from the observations of Stein on the development of *Cysticercus tenebrionis**; while we also know from Grassi and Rovelli's* account of the development of the Cysticercoid of *Taenia elliptica* that the development by progressive invagination also obtains.

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* "Beiträge zur Entwickelungsgeschichte der Eingeweidewürmer." Zeitschr. f. wiss. Zool. iv. Band (1853). Confirmed by Meissner, "Zur Entwickelungsgeschichte und Anatomie der Bandwürmer." Zeitschr. f. wiss. Zool. v. Band (1854).

In some respects *Polycercus* is more nearly related to *Staphylocystis* than to any other known form of Cestode larva. In both the development is a process of *external proliferation* from the product of the hooked embryo—the essential similarity of the two cases being somewhat disguised by the development in *Polycercus* of an adventitious investment or kyst, not represented in *Staphylocystis.* But Villot's† account of the mode of formation of the Cysticercoid differs widely from what we have observed in *Polycercus.* He describes the bud as forming a hollow vesicle or cyst, within which is formed an internal hollow bud, which grows until it comes into apposition with the opposite wall of the cyst, when it becomes invaginated—the wall of the cyst giving rise to the caudal vesicle, the proximal part of the internal bud to the "body" and the invaginated part to the head.

Summary of Results.

(1) The hooked embryo in *Polycercus* develops into a rounded cellular body, which becomes enclosed in a cyst probably entirely of an adventitious character.

(2) Buds are given off from the periphery of the mass and develop into Cysticercoids, which soon become free in the interior of the cyst.

(3) The head, with its hooks and suckers, is developed from the central portion of the solid bud; the middle layers form the 'body' and the outermost the caudal vesicle.

(4) *Polycercus* is not nearly related to *Echinococcus*, but finds its closest ally in *Staphylocystis.*

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* "Embryologische Forschungen an Cestoden." Centralbl. f. Bakteriologie u. Parasitenkunde, v. Band (1889).

† "Migrations et Métamorphoses des Ténias des Musaraignes." Ann. Sci. Nat., 6me. série, Tome viii. (1878).

EXPLANATION OF PLATES.

Plate xix.

Fig. 1.—Anterior portion of a specimen of *Didymogaster sylvatica*, Fletcher, laid open along the middle dorsal line in order to show the numerous rounded cysts containing *Polycerci*. Slightly magnified.

Fig. 2.—Five of the cysts as seen under a low magnifying power (10 diameters); the polygonal areas represent the contained Cysticercoids.

Fig. 3.—Early stage in the development of *Polycercus* from the hooked embryo; first traces of proliferation.

Fig. 4.—A somewhat later stage.

Fig. 5.—Still later stage than fig. 4, the cellular mass divided externally into numerous broad lobes. *a*, wall of cyst.

Fig. 6.—Stage in which some of the buds have assumed the general form of the future Cysticercoid and are connected to the central mass only by narrow stalks; other buds at earlier stages in their formation.

Fig. 7.—Portion of a section of a young bud, with the spindle-shaped cells from which the hooks will be developed situated in the centre of the cellular mass. Magnified about 250 diameters.

Fig. 8.—Developing Cysticercoid of *Polycercus*, in which the rostellum, with its hooks, and the suckers have become formed; the rostellum retracted within the head and not yet connected with the external aperture. *r*, anterior, and *r'*, posterior parts of rostellum; *s*, suckers; *e*, excretory aperture; *c*, internal cavity.

Plate xx.

Fig. 1.—A stage in the development of *Polycercus* similar to that represented in fig. 9 of Plate xix., but showing the external aperture and the two layers of the body-wall. *a*, aperture in wall of cyst; other letters as in preceding figure.

Fig. 2.—Sheath of the rostellum of the same more highly magnified to show the spinules along the border.

Fig. 3.—Similar stage, with the rostellum partly evaginated and extending towards the aperture. Letters as in fig. 1.

Fig. 4.—Fully developed Cysticercoid in the unextended condition, the connection between the sheath of the rostellum *(sh.)* and the edges of the aperture now established. Letters as in fig. 1.

Fig. 5.—One of the hooks of the rostellum. Highly magnified.

Fig. 6.—Cysticercoid, with the rostellum fully evaginated.

Fig. 7.—Fully extended Cysticercoid. *r*, rostellum; *s*, suckers; *b*, "body"; *c.v.*, caudal vesicle.

Fig. 8.—Transverse section through unextended Cysticercoid. *a*, central tissue of rostellum; *b*, layer of circular muscular fibres; *c*, longitudinal layer of muscular fibres; *d*, sheath; *s*, suckers; *t*, wall of cyst.

Fig. 9.—Longitudinal section. *h*, hooks; other letters as in fig. 8.

ON THE HOMOLOGIES OF THE BORDERS AND SURFACES OF THE SCAPULA IN MONOTREMES.

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(Plate xxi.)

There is not yet anything like a complete consensus of opinion regarding the homologies of the borders and surfaces of the monotreme scapula; and indeed some very discrepant views have been set forth by various anatomists.

We shall not enter upon a description of the bone in detail, since the accounts given in several of the works dealing with the subject are satisfactory enough, and several of them are accompanied by figures (see list of references). It is with regard to the interpretation of the parts of the bone that we propose to offer a few observations.

Our attention was directed to the subject during the course of an investigation by one of us (M.) into the myology of the shoulder region in *Ornithorhynchus* and *Echidna*, the results of which will be published shortly.

Ever since Owen (1) the *actual* anterior margin of the monotreme scapula ['margo anterior' of Meckel (2); 'bord antérieure' of Cuvier (3)] has been generally recognised as the representative of the free margin of the mesoscapula, *i.e.*, as the free border of an anteriorly projecting scapular spine. This interpretation has at least been adopted by Flower (and Gadow) (4) and by Mivart (5), and it is in our view undoubtedly correct, being well supported by a study of the muscular attachments.

Giebel, however, in Bronn's 'Thier-Reich' (6) simply notices this border of the bone as a straight 'anterior' border, while, in his "Zootomie aller Thierklassen," Brühl (7) not only figures it merely under the latter name, but even designates the ridge running dorso-ventrally on the outer aspect of the scapula of *Echidna* as "die bei Echidna deutliche Spina"!

The true representative of the anterior or coracoid costa of the typical mammalian scapula was identified by Owen (1) in *Ornithorhynchus* with a ridge running dorso-ventrally on the 'inner' aspect of the bone. Along the line of this ridge the actual anterior part of the bladebone is flexed outwards so as to produce a marked hollowing of the whole outer surface. Dorsally the ridge begins close to the mesoscapular margin, but it inclines backwards as it passes ventrally and terminates, at the inferior or ventral extremity of the bone (glenoid region), near to the base of the acromion.

Except for this ridge the prescapula is totally suppressed. That area of the inner surface of the bone extending from the ridge in question to the free 'anterior' mesoscapular margin seems to represent that portion of the prescapular fossa which is ordinarily formed by the mesoscapula. And the opposite or 'outer' aspect of this same portion of the blade forms part of the wall of the postscapular fossa, giving origin to fibres of the infraspinatus muscle, which extends forwards as far as the mesoscapular margin. The posterior limit of the postscapular fossa is indicated by a distinct ridge, to which the scapular triceps is attached, and of which more anon.

It seems strange that Flower and Gadow *(loc. cit.)* should completely ignore the well-marked *prescapular* ridge on the inner aspect of the scapula of Platypus; especially as Owen *(loc. cit.)* so distinctly drew attention to it as the true 'anterior costa.' But the omission is possibly to be explained by the fact that, in their remarks on the monotreme scapula, the authors referred to seem to have had regard more particularly to the structure of the scapula in *Echidna* (which alone they figure); and in this it is to be admitted the prescapular ridge is not represented by any recognisable mark. According to Owen *(loc. cit.)* it is "nearly obsolete" in *Echidna*. We hope to show, however, that, notwithstanding the absence of a distinct prescapular ridge, the condition in *Echidna* (as regards muscular attachments, &c.) does so essentially resemble that in *Ornithorhynchus* that it is an exceedingly simple matter to homologise the parts in the two genera. And if we interpret the ridge on the inner surface of the scapula of *Ornithorhynchus* (after Owen) as the true morphological anterior border (prescapular), it becomes comparatively easy to exhibit the real correspondence of the borders and surfaces of the scapula in monotremes to those in the typical mammalian scapula.

The identification of an area of the 'outer' surface of the scapula, by reason of its giving origin to the infraspinatus muscle, as 'postscapular fossa,' has already been alluded to. In *Ornithorhynchus* this postscapular 'fossa' extends from the actual anterior (true mesoscapular) margin of the bone as far back as the ridge already referred to as giving attachment to the scapular triceps. The like is true also of the scapula in *Echidna*, but here the tricipital ridge does not lie so far back as it does in the Platypus, but is separated by a considerable interval from the actual hinder border of the bone. In fact the 'outer' surface of the scapula in *Echidna* is nearly bisected into preaxial and postaxial halves by the tricipital ridge, which is more strongly marked than in *Ornithorhynchus*.

It may now be asked how the mode of attachment of the supraspinatus muscle agrees with the view so far expressed respecting the homologies of the parts of the bone. Naturally we should expect to find it associated with that part of the bone which represents the region of the prescapular fossa; and this, it will be remembered, we regard as that area of the inner surface of the scapula in *Ornithorhynchus* which lies between the *actual* anterior (mesoscapular) border and Owen's 'true anterior costa,' *i.e.*, the ridge formerly described. But the supraspinatus in *Ornithorhynchus* is a relatively very minute muscle, and it does not by any means occupy the whole of the above area. Its origin is restricted to an exceedingly small portion of the bone close to the glenoid region and near to the root of the acromion. The *prescapular* ridge indeed fades away ere it reaches the origin of the supraspinatus, but its faint continuation towards the coracoid passes behind the muscle, which is thus situated to its acromial or mesoscapular side, as one would naturally expect.

Immediately above (dorsad of) the origin of the small supraspinatus is the attachment of another small muscle, the omohyoid, quite close to the continued prescapular line. The greater part of the 'prescapular fossa' is, however, occupied by portions of the attachments of the serratus magnus and acromiotrachelien muscles, which have, as it were, encroached upon the domain of the supraspinatus.

The area of the 'inner' surface of the scapula posterior to (*i.e.*, caudad of) the prescapular line (in *Ornithorhynchus*) is covered by part of the subscapularis muscle, fibres of which arise from the major part of it. The origin of this muscle reaches backwards to the actual posterior margin of the bone, and, further, extends around this upon the 'outer' aspect.

In *Echidna* the condition of the 'inner' surface of the scapula as to muscular attachments is, superficially, a very different one; and it is this fact which has probably largely helped to render the interpretation of the monotreme scapula more obscure. As stated above, there is in *Echidna* no recognisable prescapular ridge corresponding to that in *Ornithorhynchus*. At the same time, the supraspinatus muscle is relatively a very much larger muscle, whose origin occupies a very considerable area of the 'inner' surface of the bone, viz., nearly the whole of the inferior or ventral half of the surface above the glenoid region. As in *Ornithorhynchus*, the narrow attachment of the omohyoid muscle is placed immediately dorsad of it, in this case crossing the inner surface antero-posteriorly. The dorsal moiety of the surface, amounting to fully one-half of the 'inner' surface of the bone, is in large part bare of actual muscular attachment; but, dorsally, the insertion of the serratus magnus occupies it and extends far ventralwards near both the anterior and posterior limits of the surface. As in *Ornithorhynchus*, the acromiotrachelien has an attachment close to the mesoscapular margin in front (cephalad) of the supraspinatus, and just ventral to the serratus magnus.

Thus it would almost appear as if nearly, if not quite, the entire 'inner' surface of the scapula in *Echidna* answered to that area in *Ornithorhynchus* included between the mesoscapular margin and the prescapular ridge, the *subscapularis area* of the inner surface in the latter animal being thus unrepresented. But this is not absolutely the case. For even in *Echidna* there is a narrow strip (as much as 3 mm. wide) of this same inner surface close to the actual posterior margin which is occupied by fibres of the subscapularis, though the major part of this muscle arises from the opposite ('outer') aspect of the bone. Plainly this posterior narrow subscapular strip of the inner surface corresponds to the broad subscapularis area of the 'inner' surface of the Platypus scapula which lies caudad of the prescapular ridge. We do not hold that it is necessary to suppose that the mere line of limitation between subscapularis on the one hand and supraspinatus on the other is the actual site of the morphological anterior border (prescapular ridge), but we do hold that either this is the case or, as is perhaps more likely, the absolute suppression in *Echidna* of any ridge marking the anterior costa has allowed of an encroachment by the supraspinatus upon the adjacent subscapularis area.

Flower (4), indeed, probably following Mivart [(5) p. 384], seems to imagine that the subscapularis in *Echidna* arises entirely from the 'outer' aspect of the scapula, and that it is limited behind by the posterior margin of the bone. Westling (9) also adopts this view.

Thus Mivart [(5) p. 398] states that in *Echidna* "the supraspinatus fossa is on the internal costal surface of the bone, and the infraspinatus is immediately behind its actual anterior margin. But," he continues, "while in *Ornithorhynchus* the subscapularis occupies that part of the internal or costal surface of the scapula which is not occupied by the supraspinatus, in the *Echidna*, on the other hand, the subscapularis occupies exclusively the external surface of the scapula." And upon the strength of this view of the anatomy of *Echidna* Flower and Gadow accept the *actual* posterior margin of the scapula in the monotremes as the true morphological anterior costa or coracoid border.*

This view seems to us to be an erroneous one. The origin of the subscapularis even in *Echidna* not only occupies part of the 'outer' surface and the whole of the posterior border of the bone, but extends round it so as to occupy the narrow strip of the 'inner' surface aforesaid. And when we turn to the scapula of Platypus we find that the subscapularis area of the inner surface is so great as to include the major part of that surface. These considerations appear to us to vitiate a large part of Flower's interpretation of the monotreme scapula, which is based upon a mistaken view of the real condition in *Echidna*, and which fails to give due weight to the condition in *Ornithorhynchus*. But if we are to deny the homology of the actual posterior margin of the scapula to the true anterior or coracoid costa as suggested by Flower, in what light are we to regard the former ?

Owen (1) simply accepts it as the "posterior margin or costa," and, so far as we know, all authorities save Mivart and Flower and Gadow so regard it *(cf.* Giebel and Brühl, *loc. cit.).* Here, however, we agree with Flower and differ from Owen in taking as the true morphologically posterior, or glenoid, or postscapular margin, that ridge on the 'outer' surface of the scapula which is present in both the genera, though most strikingly evident in the *Echidna.* This ridge we have already referred to as the 'tricipital.' Mivart states [(5) p. 401] that it might be considered to correspond to the axillary margin of the scapula of an ordinary mammal.

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* In a passage on p. 402 of his Memoir (5) Mivart says of *Echidna* :— "In that animal I find no trace of a ridge on the inside of the scapula like that which, in *Ornithorhynchus*, separates the supraspinatus from the subscapularis; but the supraspinatus is, nevertheless, separated from the subscapularis by a very large lamella, which throws the last-mentioned muscle entirely to the outer side of the scapula, and is the only one developed except that separating the supra- from the infraspinatus." Thus it would appear as if Mivart also were inclined to regard the actual posterior margin in *Echidna* as morphologically the anterior; while in *Ornithorhynchus* the homologue to the latter would be Owen's 'anterior costa' ridge. But this theory supposes a very wide discrepancy between the condition of the scapula in the two genera.

Owen styles the subscapularis in *Ornithorhynchus* "a narrow muscle" and regards it as restricted to the 'inner' surface; whilst, as we have seen, Mivart and Flower regard it in *Echidna* as equally restricted to the 'inner' surface. We find that in both instances the description is inaccurate—as already indicated for *Echidna*—and, for *Ornithorhynchus,* in the fact that a great part of what Owen has taken for teres major arising from the hinder part of the outer surface of the bone is really part of the subscapularis. In the scapulæ in both forms, in short, the subscapularis arises from both 'inner' and 'outer' surfaces (the proportions differing much in the two cases), and from the whole of the *actual* posterior margin itself. The latter we are therefore disposed to look upon as constituting morphologically a mere exaggerated ridge—perhaps of the same nature as the prominent and strongly marked subscapular ridge close to the true glenoid border of the human scapula.*

That the morphologically posterior, glenoid, or postscapular border of the monotreme scapula is, as Flower believes, represented by the ridge upon the outer surface is testified to by its relation in the way of attachment to the scapular triceps as well as by its forming the true separation between the infraspinatus and subscapularis muscles in the scapulæ of both the genera of the order.

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* This idea has at least been harboured by Mivart in reference to the scapula of Platypus, for he holds that we may theoretically consider "that there is a plate developed opposite to that separating the supra- from the infraspinatus muscle, which, as it were, passes into the midst of the subscapularis, throwing the posterior part of it to the outside and on to the same surface as that occupied by the infraspinatus, while the rest of it is but very slightly separated from the supraspinatus." The view of the writers is simply that this theory of the nature of the posterior margin of the scapula is good for *both* forms of monotreme scapula.

But it is not alone in the Monotremata that a displacement of the true postscapular border on to the outer surface of the scapula seems to occur. In his account of the anatomy of the scapula of *Myrmecophaga tetradactyla* in Bronn's "Klassen und Ordnungen des Thier-Reichs," Giebel [(6) p. 408, pl. LXX. fig. 5] describes the second or postscapular spine in the following terms:—"Ihr fast parallel [to the mesoscapular spine] läuft eine zweite Gräte, *der eigentliche Hinterrand* [the italics are ours], hinter welchem aber die Platte des Schulterblattes noch betrachtlich erweitert ist." And the condition here described is common to many edentate forms [(6) pl. LXX. and (8) pl. XXI.-XXIII.] and is also very prominent in the marsupial *Notoryctes typhlops* (10). In these cases it is associated with a very great development of the scapular triceps. Thus in *Dasypus sexcinctus* Galton (11) describes the scapular triceps as the largest part of the muscle, and as arising from the "inferior or lesser spine of the scapula along the whole of its extent." He also found a part attached to the actual "axillary" border of the bone just posterior to the neck of the bone which he opined to be the representative of the human long head; but in view of all the facts, we cannot admit this to be so to the exclusion of the rest of the scapular fibres. Indeed, the fact is that where the postscapular spine is present the triceps is not usually confined to it alone but spreads backwards upon the flat surface of bone behind it as far as the actual posterior margin of the bone, from which also fibres generally arise.

This at least is the case in *Notoryctes*, as ascertained by one of us (W.), and apparently it is so also in *Chlamydophorus truncatus* (12), in which a postscapular spine is well developed and the scapular triceps is "enormous."

In *Orycteropus capensis* Humphry (13) simply describes a very extensive origin by three divisions from the "posterior costa"; but, as in this animal the postscapular spine rises from the external surface pretty close to the actual posterior border, there can be no doubt that the attachment of the large muscle actually reaches as far as the ridge and is not confined to the actual posterior margin of the blade. Galton's description of the condition in this animal does not differ from Humphry's in any essential feature (14).

Many rodents also exhibit a similar though less notable postscapular spinous development, as may be well seen in the genus *Arctomys* [(6) pl. LXXI. fig. 11, and (8) pl. XXIV. fig. 14].

If Giebel's interpretation of the postscapular spine in Edentata be correct, we can then bring the monotreme condition in this respect well into line with the latter, as may be seen from a comparison of the series of figures 5-8.*

If the views we have expressed are correct, then there can be little difficulty in homologising the two forms of monotreme scapula. In both forms the actual anterior border is mesoscapular. In both the prescapular part of the bone is suppressed, though in Platypus its site is still indicated by a ridge on the inner surface. In both scapulæ the actual posterior border is really secondary, being an exaggerated subscapular ridge, the subscapularis muscle taking origin both from the ridge itself and the bone on both sides of it. Finally, and as a consequence of the last character, the postscapular border is displaced outwards and exists as a mere 'tricipital' ridge upon the outer surface of the flat bladebone.

Figs. 5-8 diagrammatically illustrate the points just summarised.

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* We have already casually referred to the extraordinary view propounded by Brühl (7) that the postscapular ridge in question (tricipital) is "die bei Echidna deutliche Spina." In *Ornithorhynchus* he less confidently suggests a like view of the corresponding ridge. This theory not only ignores Owen's view (accepted by Flower) of the true spinous (mesoscapular) character of the actual anterior margin, but reveals either an entire ignorance of the muscular attachments of the scapula or a very extraordinary method in their interpretation. Thus in *Echidna* he suggests that the surface in front of this (tricipital or postscapular) ridge is a prespinous fossa, possibly homologous to the supraspinous fossa of higher mammals. But it is this very area which is occupied by the origin of the infraspinatus muscle; while the area behind the same ridge, regarded by Brühl as postspinous and possibly homologous to the infraspinous region, is occupied by part of the subscapularis muscle.

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EXPLANATION OF FIGURES.

PLATE XXI.

Each of the figures 1-4 has a key-sketch 1*a*-4*a*, showing the outlines of the muscular attachments.

The outlines of muscular attachments were drawn after careful examination of several specimens.

In figures 3*a* and 4*a* the partly broken off suprascapular part of the specimen, from which figures 3 and 4 were drawn, has been traced in.

Fig. 1. —Scapula (left) of *Ornithorhynchus*, internal aspect (nat. size).

Fig. 1*a*.—Tracing from fig. 1, with outlines of muscular attachments filled in.

Fig. 2. —Scapula (left) of *Ornithorhynchus*, external aspect (nat. size).

Fig. 2*a*.—Tracing from fig. 2, with outlines of muscular attachments filled in.

Fig. 3. —Scapula (left) of *Echidna* (youngish specimen), internal aspect (nat. size).

Fig. 3*a*.—Tracing from fig. 3, with outlines of muscular attachments filled in.

Fig. 4. —Scapula (left) of *Echidna*, external aspect (nat. size).

Fig. 4*a*.—Tracing from fig. 4, with outlines of muscular attachments filled in.

Figs. 5-8.—Diagrammatic outlines of sections across long (dorso-ventral) axis of several forms of scapula.

Fig. 5.—Typical mammalian.
Fig. 6.—*Ornithorhynchus.*
Fig. 7.—*Echidna.*
Fig. 8.—*Myrmecophaga.*

Lettering thus in figs. 5-8 :—

A.—Mesoscapular border (spinous).
B.—Prescapular border (anterior or coracoid).
C.—Postscapular border (posterior or glenoid).
D.—Subscapular (?) ridge.

Lettering of figs. 1*a*-4*a*.

Ac. Tr.′—Acromio-trachelien insertion of dorsal part. *Ac. Tr.*″—Acromio-trachelien insertion of ventral part. *Clav. Delt.*—Clavicular part of deltoid muscle, origin. *Inf. Sp.*—Infraspinatus origin. *O.H.*—Omohyoid. *Rb.*′—Rhomboid, ant. part. *Rb.*″—Post. part. *Sc. Delt.*—Origin of scapular deltoid. *Ser. Mag.*—Ins. of cervical part of serratus magnus. *S. M. Cost.*—Ins. costal part. *Sb. Sc.*—Origin of subscapularis on 'inner' surface. *Sub Sc.*—Subscapular origin on 'outer' surface. *Sup. Sp.*—Origin of supraspinatus muscle. *T. Major.*—Teres major, origin. *T. minor.*—Teres minor, origin. *Triceps L. H.*—Scapular triceps, origin. *Trap.*′—Ant. part of trapezius. *Trap.*″—Post. part of trapezius.

N.B.—Figs. 1-4 are from drawings from nature by Mr. G. H. Barrow.

TRICOMA AND OTHER NEW NEMATODE GENERA

(WITH FIFTY ILLUSTRATIONS IN THE TEXT).

BY N. A. COBB.

INTRODUCTORY NOTE.

This article is descriptive of twenty new species of Nematodes, including ten new genera, found by the author at various times since November, 1888. The worms are all free-living and marine, having been taken from the Atlantic (Mediterranean), Indian (Ceylon), and South Pacific (Australia) Oceans. The Mediterranean and Ceylon species are described from specimens preserved in balsam; the Australian species are described also from specimens in balsam, excepting the species of *Monhystera*, which were examined fresh.

FIG. 1.—Diagram in explanation of the descriptive formula used for Nematode worms; 6, 7, 8, 10, 6 are the transverse measurements, while 7, 14, 28, 50, 88 are the corresponding longitudinal measurements. The formula in this case is:—

$$\begin{array}{ccccc} 7\cdot & 14\cdot & 28\cdot & 50\cdot & 88\cdot \\ \hline 6\cdot & 7\cdot & 8\cdot & 10\cdot & 6\cdot \end{array}$$

The unit of measurement is the hundredth part of the length of the worm, whatever that may be. The measurements become, therefore, percentages of the length.

The measurements are taken with the animal viewed in profile; the first is taken at the base of the pharynx, the second at the nerve-ring, the third at the cardiac constriction, the fourth at the vulva in females and at the middle (*M*) in males, the fifth at the anus.

I. TRICOMA, new genus.

The worms belonging to this genus will in future be readily recognised by the unusual appearances presented by the cuticula. The striations are so coarse as to suggest the segmentation of an annelid. This appearance is so deceptive that one of the most renowned helminthologists in Europe pronounced the only specimen yet seen to be the larva of an annelid worm. It was therefore with some hesitation that I included the specimen in my Nematode collection. However, after careful examination I am convinced that the worm is a representative of an hitherto unknown Nematode genus. The only specimen in my possession was probably either lost or destroyed; not, however, until after the accompanying reliable drawings of the two extremities had been made with the aid of the camera lucida.

T. CINCTA, n.sp. The length, which I give from memory, was somewhere between one and two millimetres, and the width probably about three to four hundredths as great. The coarsely striated cuticula bore hairs throughout the length of the worm, in cycles of three. The head, surmounting a cylindroid neck, bore three setæ, nearly as long as the neck was wide, each of which issued from a conoid projection at the base of one of the three lips. The lips projected forward in the form of a cone and were flanked by large cuticular expansions, or cephalic alæ. The œsophagus averaged nearly one-third as wide as the neck;—I remember nothing further concerning its structure. Whether any bulbs existed I cannot say. The tail ended in an unmistakable

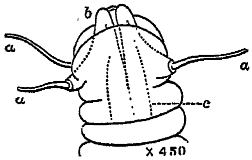

FIG. 2.—Head of *Tricoma cincta.*
a, three cephalic setæ; *b*, mouth; *c*, œsophagus.

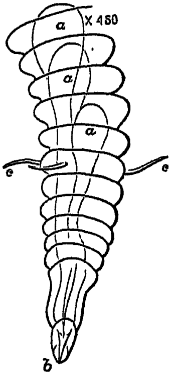

FIG. 3.—Tail of *Tricoma cincta.*
aaa, three caudal glands; *b*, terminus; *c*, caudal hairs.

outlet for the three caudal glands,. which were to be dimly seen. These few notes comprise all that is known concerning the structure of a worm which, were it less remarkable, I should not notice at this writing.

Hab.—Sea-sand, Bay of Naples, 1888.

II. PELAGONEMA, new genus.

Pelagonema is a genus related to *Oncholaimus.* The walls of the pharynx, however, bear no teeth. At the very base of the pharynx an indistinct elevation is to be seen, but I am doubtful whether it is homologous with any mouth-part in *Oncholaimus.* The neck is slender and tapers much. The œsophagus is very narrow in the anterior half, but gradually expands behind the broad and conspicuous nerve-ring until in the posterior fourth it becomes about three-fourths as wide as the neck. Opposite the lower part of the pharynx are several bodies characterised by staining in carmine. These are round or ellipsoidal and about one-half as wide as the pharynx. It is probable that two of these structures represent lateral organs. At any rate they are not all alike. They are indistinct, and, furthermore, exceedingly small, and therefore escape accurate observation. The tail is elongated and slender, and its slightly swollen terminus gives exit to the secretion of caudal glands. In the single known species the female organs are double and symmetrically reflexed. The worm has the general appearance of an attenuated *Oncholaimus ;* still, the mouth is so peculiar that I do not venture to class it as a member of that genus.

P. SIMPLEX, n.sp. $\frac{\cdot 6 \quad 9\cdot 8 \quad 21\cdot \quad \text{‘}58\text{’}^{19} \quad 92\cdot 5}{\cdot 6 \quad 1\cdot 1 \quad 1\cdot 4 \quad 2\cdot 2 \quad \cdot 9}$ 2·mm. The cuticula is apparently non-striated. No hairs of any kind were seen. The conoid neck terminates in a rounded head, with lips resembling those of *Oncholaimus.* The simple elongated pharynx is one-half as wide as long. Opposite its lower part occur structures about one-half as wide as the pharynx itself, bodies which may be the lateral organs. There are no eyes. The lateral fields are one-tenth as wide as the body. The œsophagus is anteriorly one-fourth to one-third as wide as the neck; posteriorly it is three-fourths as wide as the neck. This change in relative diameter takes place gradually behind the nerve-ring. The latter is three times as wide as the œsophagus at the point encircled and is in all cases oblique. The excretory pore is situated just behind the nerve-ring. There is a distinct cardiac collum. The anterior half of the tail is conoid from in front of the inconspicuous anus. The posterior half of the tail is nearly cylindrical, having a diameter one-fourth as great as the body-diameter at the anus, but expands at the naked terminus into a bulb nearly twice as wide. The reflexed portions of the ovaries reach about half-way to the vulva and contain several developing ova. One or two thin-shelled unsegmented eggs nearly twice as long as the body is wide and about half as wide as long are commonly to be seen in each uterus. Male unknown.

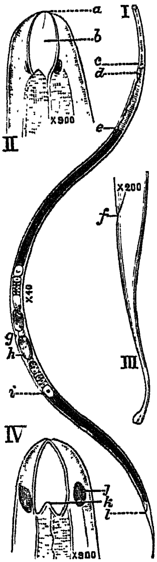

FIG. 4. — I, female of *Pelagonema simplex*. II, lateral view of head of same worm more highly magnified. III, tail of the same worm. IV, ventral view of head of same worm.

a, mouth.
b, pharynx.
c, nerve-ring.
d, excretory pore.
e, cardiac constriction.
f, anus.
g, vulva.
h, egg.
i, fold in ovary.
j, nucleus.
k, rudimentary tooth at base of pharynx.
l, anus.

Hab.—The females of this species were common among algæ on the coast of Ceylon in the month of March, 1889.

III. DEMONEMA, new genus.

The genus *Demonema* belongs to the *Enoplus* family. Three apophyses extend backward from the mouth, but the distinct teeth characteristic of *Enoplus* are absent. Nevertheless, the mouth opens after the manner of a three-jawed chuck as in *Enoplus* and the three lips are here armed with numerous powerful teeth. Spiral lateral organs occur near the mouth. The female sexual organs are symmetrical. Like the *Enopli*, these worms are carnivorous.

D. RAPAX, n.sp. $\frac{1{\cdot}5 \quad 7{\cdot}4 \quad 14{\cdot} \quad \text{‘}50\text{’}^{22} \quad 94{\cdot}}{2{\cdot}2 \quad 2{\cdot}7 \quad 3{\cdot} \quad 4{\cdot}4 \quad 2{\cdot}6}$ 1·25—2 mm. The rather thin cuticle bears papilla-like hairs throughout and is traversed by about one thousand transverse striæ, 2·2μ apart, and composed of dots also about 2μ apart. The neck tapers but little; the head is rounded. The spiral lateral organs are one-third as wide as the head and are situated opposite the middle of the pharynx; the the left hand organ is a right-handed spiral, and the right hand one, of course, a left-handed spiral. The six very short cephalic setæ are seen with difficulty; two are lateral and four are submedian. A second row of four (?) submedian setæ occurs immediately behind the lateral organs. When the lips are closed the pharynx appears as a central chitinous line accompanied by three apophyses, one of which is ventral and two of which are dorsally submedian. The three "apophyses" are the optical expression of three deep folds in the closed pharynx. When the mouth is opened to seize the prey, the three parts of the pharynx corresponding to the three lips spring outward, being moved by powerful muscles. The mouth closes after the manner of a chuck, and the prey is held firmly by means of numerous large horny teeth on the inside of the anterior part of each jaw. The œsophagus is phalangiform and muscular; in the narrowest part it is half

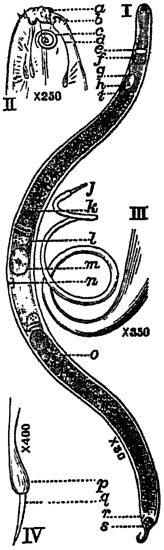

FIG. 5.—*Demonema rapax.*

I, female. II, head of same III, tail, spirally wound, showing its use as a prehensile organ. IV, terminus, showing the elongated outlet for the caudal glands.

a, lips.
b, cephalic setæ.
c, lateral organ.
d, ventral apophysis.
e, nerve-ring.
f, ampulla of duct of ventral gland.
g, (?).
h, ventral gland (black).
i, intestine.
j, terminus.
k, bend in ovary.
l, uterus.
m, egg.
n, vulva.
o, cells of intestine.
p, swelling at terminus.
q, slender terminus.
r, anus.
s, three caudal glands.

as wide as the neck, in its widest parts three-fourths as wide as the neck. The cardiac collum is broad but distinct. The intestine is three-fourths as wide as the body, and is composed of rather transparent cells of such a size that three or four of them build the circumference. The intestine of this little worm often contains two or three other Nematodes two-thirds as long as the worm itself, which have been swallowed whole, a fact which sufficiently attests the rapacity of the species. The ventral excretory pore is situated just behind the nerve-ring. The gland lies in the cardiac region; its duct is rather narrow, but the ampulla is distinct. The indistinct lateral fields appear to be one-fifth as wide as the body. The anterior fourth of the tail is conoid; the remainder is very narrow, flexible, and prehensile. The terminus is slightly swollen and tipped with a much elongated outlet for the caudal glands; these latter, three in number, are situated in the anterior part of the tail, just behind the anus. The vulva is rather conspicuous. Vaginal glands are present. Each uterus usually contains a thin-shelled unsegmented egg as long as the body is wide and two-thirds as wide as long. The ovaries reach from one-half to two-thirds the way back to the vulva and contain half-a-dozen developing ova. The male remains unknown.

Hab.—Coral bank, Bay of Naples, 1888, at a depth of thirty-five metres.

IV. Chromadora, Bastian.

I cannot attempt to say what will be the final definition of *Chromadora.* It is now known that a large number of forms exist which must be reckoned either as belonging to *Chromadora* or to closely allied genera, and already much has been accomplished towards unravelling their relationships, notably by Dr. de Man in a series of admirable memoirs; but much remains to be done before our knowledge of these worms can claim to be thorough. I deal here with a species which I believe will be reckoned a *Chromadora.*

C. MINOR, n.sp. $\frac{\cdot 6 \quad 9\cdot \quad 15\cdot \quad `48\cdot" \quad 86\cdot}{1\cdot 7 \quad 3\cdot 2 \quad 3\cdot 7 \quad 4\cdot 8 \quad 2\cdot 8}$ 1·mm. The cuticle is traversed by transverse striæ resolvable with high powers into rows of alternating light and dark, uniform, rectangular, elongated markings. This is a feature common to *Chromadora* and a few other genera. Whether these markings are always uniform in *Chromadora* is open to question. It has been proposed that where the markings are not uniform, that is to say are different on the lateral fields, the species should be reckoned as a *Spilophora*, provided of course that the worm presents the other features characteristic of *Spilophora*. The idea is a good one, but certain differences in the markings on the lateral fields are to be found even in *Chromadora*, and it remains to be seen to what extent this difference may develop in the genus. The cuticle of *C. minor* bears in general none but most inconspicuous hairs, the cephalic and subcephalic setæ of course excepted. The neck is conoid to the truncate head, which bears, opposite the pharyngeal tooth, a seta on each submedian line, four in all; these setæ are acute, arcuate, and about half as long as the head is wide. Farther back, namely, opposite the eye-spots soon to be described, occur eight subcephalic setæ, a pair being arranged one in front of the other on each submedian line. The lip region is transparent and the arrangement of the lips is difficult to make out. I believe, however, that three obscure confluent lips exist and that each presents about four longitudinal striations, and furthermore that these striations are the optical expression of a dozen chitinous processes which might almost be denominated teeth, or at least biting organs. Each lip presents two papillæ on its anterior surface. The pharynx may be said to extend almost as far back as opposite the eye-spots; in the formula, however, I have measured only to the tooth which exists on the dorsal side of the pharynx. This small tooth is hook-shaped and points forward; it serves to give the worm a grip on its food by acting in opposition to the lips and their chitinous processes. The position of this tooth is, as already stated, dorsal. I emphasise this because I have seen specimens in which this tooth appeared to be ventral. In fact, I was very near describing one such specimen as a *Hypodontolaimus* of de Man. The appearance is highly deceptive, and therefore worthy of description. The worm by an exact half turn in the middle part of its body presents the whole of the head and neck reversed,—what is dorsal appearing ventral. The only way of discovering this distortion is by carefully following up the lateral fields; the twist in the body will then be discovered. In all cases, therefore, where *such an anomaly* as a *ventral tooth* appears, care should be exercised before coming to a decision as to the actual facts of the case. I did not discover the position or nature of the lateral organs. The eyes, or rather eye-spots, are situated in the œsophagus at a distance from the anterior extremity twice as great as the width of the head. There is a distinct tendency toward a dorsal agglomeration of the yellowish-brown pigment of which the spots are composed, and to a dorso-ventral division of the dorsal part into halves. The ventral pigment consists of a narrow yellowish streak of the same length as the large dorsal mass, namely, a length equal to half the width of the head. There is no distinct refractive body connected with the eye-spots. The œsophagus expands slightly to receive the pharynx, and thence to the posterior bulb measures one-third as wide as the neck; the bulb is prolate, measures four-fifths as wide as the base of the neck, and presents a distinct and extensive internal chitinous lining for the attachment of its powerful radial muscles. These latter are very effectual in exerting suction. I remember to have seen a *Chromadora* seize on to the surface of one of my glass object-slides with its mouth and move its tail up near to the head, when the caudal spinneret came into play and secured a hold; then, releasing the head, the little animal proceeded to execute a movement similar to that made by the larvæ of the Geometrid moths, by reaching forward and again seizing on to the face of the glass with its mouth and again drawing forward its tail. Of course nothing but suction could have so attached the mouth of the worm to the smooth surface of glass. The œsophagus is separated from the intestine by a deep and conspicuous constriction. The granular intestine is two-thirds as wide as the body and is of a yellowish colour, being composed of cells of such a size that nine of them make up a circumference. The rectum is situated at an angle of forty-five degrees with the axis of the body, and has a length equal to that of the anal body-diameter. The narrow unicellular ventral gland lies just behind the cardiac constriction, and is two to three times as long as the body is wide. Immediately behind it occurs an organ about one-fourth as long, which, however, stains differently. This organ is ventral and contains two large and peculiar nuclei arranged on opposite sides of the ventral line. What is this organ? Before answering let us call attention to two cells near the cardiac bulb in *Plectus*, another genus of free-living Nematodes. If I am not mistaken the first to see these cells in *Plectus* intelligently was Joseph. He suggested that they were nerve-cells. They are joined by a commissure, are subventral in position, and are near the ventral gland, which in *Plectus*, contrary to the general rule, is situated in the neck in front of the cardiac bulb. What I wish to emphasize is the proximity of the ventral gland and these two supposed nerve-cells. In my little *Chromadora minor* a similar proximity occurs—two cells, which, judging from their situation and structure, may be nerve-cells, are ranged close behind the ventral gland. We may not be wrong, I think, in calling these two cells nerve-cells; it is with more hesitation that I suggest them to be parts of a sympathetic nervous system, traces of which have hitherto, I believe, escaped observation among Nematodes. The nerve-ring in *C. minor* is placed at an angle of forty-five degrees with the body axis. The lateral fields are one-fourth as wide as the body. The tail is conoid to the terminus, which is one-third as wide as the base of the tail and presents a small outlet for the secretion of the three caudal glands. These latter seem to be confined to the tail. The slightly projecting vulva leads into a vagina reaching half-way across the body. Each of the uteri often contains a roundish egg, which is deposited before segmentation begins. The ovaries reach fully three-fourths of the way back to the vulva, and each contains about a dozen developing ova arranged in single file.

$\frac{\cdot6 \quad 8\cdot3 \quad 14\cdot \quad -M \quad 89\cdot}{1\cdot3 \quad 2\cdot7 \quad 3\cdot1 \quad 3\cdot8 \quad 2\cdot7}$ 1·13 mm. The male tail is like that of the female, except that the anus projects slightly. Hairs occur both in front of and behind the anus. Notable for their larger size are two ventrally submedian hairs situated opposite each other just in front of the anus. A row of from fourteen to twenty ventral accessory sexual organs, occupying a space twice as long as the tail, occur in front of the anus. The distance between any two adjacent components of this series of organs gradually increases anteriorly, as does the size of the organs. As to the structure and function of these organs, I have been able to form satisfactory conclusions. I have already pointed out the existence in the male of *Monhystera mas-papallatus* of a ventral row of minute unicellular glands, and also the existence in the male of *Dorylaimus Langii* of a ventral row of innervated papillæ. In my little *Chromadora*, however, I have clearly seen that each of these ventral accessory organs is supplied with both a nerve and a unicellular gland. The nature and position of the details will be best understood by consulting the figures. One now sees clearly how these accessory organs may serve the male during copulation. The sensitive nerve-end coming in contact with the female acts either in a reflex manner on the gland, or through the voluntary nervous system, and causes it to pour out its secretion. Concerning the function of the secretion, we must judge from other genera, such as *Rhabditis*, where the male is known to cement himself firmly to the female during copulation. We may therefore suppose the secretion of the glands to serve also in *Chromadora* the function of cementing the male to his mate, although, so far as I know, the act of copulation has

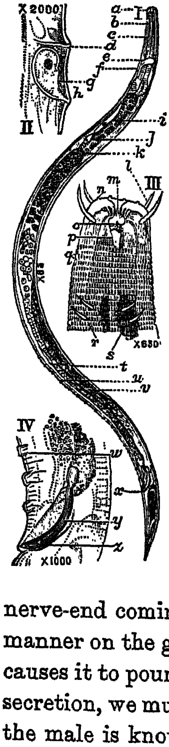

FIG. 6.—I, male of *Chromadora minor*. II, one of the ventral accessory organs of the same worm. III and IV, head and anal region of the same worm.

a, pharynx.
b, eye-spots.
c, œsophagus.
d, *h*, ventral accessory organ.
e, nerve-ring.
f, excretory pore.
g, gland of accessory organ.
i, ventral gland.
j, organ of unknown nature.
k, blind end of testicle.
l, cephalic seta.
m, ribs of pharyngeal opening.
n, papilla.
o, dorsal tooth.
p, pharynx.
q, stria.
r, sub-cephalic seta.
s, dorsal eye-spot.
t, intestine.
u, one of the ventral male accessory organs.
v, ejaculatory duct.
w, one of the accessory organs.
x, anus.
y, left spiculum.
z, accessory piece.

never been seen in *Chromadora*. In some members of *Monhystera* the male coils himself around the female once or twice, so that in that genus the ventral row of minute glands may serve to keep him from slipping. The same is almost equally probable in *Chromadora*. These statements are necessarily cautiously made, but I believe they rest on a firmer basis of observed fact than any previous remarks on the same subject. The two equal spicula are apparently of uniform size throughout, but are not so in reality. There is an anterior thin and less conspicuous part, which easily escapes observation, and which, taken together with the more conspicuous shaft, causes the organ to have somewhat the form, when seen in profile, of a segment of a circle. The distal three-fifths of the more conspicuous part, *i.e.*, the shaft, is slightly arcuate. The proximæ are not expanded. The entire length of each spiculum is considerably greater than the anal body-diameter. Arranged parallel to the spicula are two accessory pieces, two-thirds as long as the spicula themselves. The blind end of the single straight testicle is situated as far behind the cardiac constriction as the latter is behind the anterior extremity. The ejaculatory duct begins somewhat anterior to the row of supplementary organs. The spermatozoa are of such a size that six side by side would reach across the œsophagus.

Hab.—This little worm was very common among algæ in Port Jackson, New South Wales, Australia, 1893.

V. PLATYCOMA, new genus.

P. CEPHALATA, n.sp. Female unknown.

$\dfrac{\cdot 8 \quad 4\cdot \quad 15\cdot \quad \text{—M—}^{20} \quad 97\cdot 6}{\cdot 4 \quad \cdot 6 \quad \cdot 6 \quad \cdot 6 \quad \cdot 7}$ 9·7 mm. The smooth and rather thin skin bears hairs throughout the length of the animal, but these are inconspicuous except on the head and anterior part of the neck, where they are long and slender. The neck is cylindroid, diminishing suddenly at the head. The latter is rounded in front, and is set off from the neck by a broad and shallow constriction. There are ten cephalic setæ of equal size arranged in the usual manner, one being situated on each lateral line and two on each submedian line. Their average length is equal to the width of the head. The lateral organs are roundish, but are slightly broader than long; they are one-third as wide as the head. Two flat hairs of unequal length grow from the inner margin of the anterior border of each lateral organ. The larger of these hairs, the dorsal, is equal in length to the cephalic setæ. It is from these peculiar hairs that I have named the genus. The lips are three in number and apparently of large size; each is surmounted by a low mammillate conical papilla. The pharynx is narrow, almost tubular, but expands very slightly half-way back, and ends opposite the anterior border of the lateral organs. There are no eyes. The cylindrical œsophagus is one-half as wide as the neck, and is separated from the intestine by a distinct constriction. The cardia is rather large. The intestine is two-thirds as wide as the body, and is composed of large cells, only four to five being required to build the circumference. I could discover no ventral gland in the only specimen examined. The longitudinal fields are one-fourth as wide as the body. Large cells occur at frequent intervals between the intestine and the body wall. The tail is arcuate, conical, and apparently destitute of caudal glands. The two equal linear slightly arcuate spicula have a length equal to that of the anal body-diameter, and when seen in profile make an angle of forty-five degrees with the axis of the body. The proximal ends are slightly expanded. There are no papillæ before or behind the anus. Two low ventral swellings occur in front of the anus; that nearest the anus is removed a distance twice as great

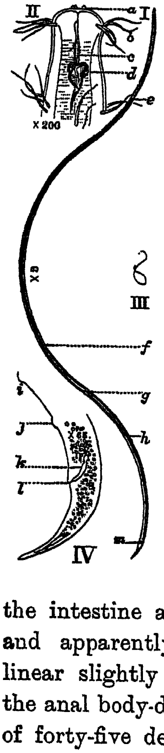

Fig. 7.—I, male *Platycoma cephalata*. II, head of same more highly magnified. III, the same worm natural size. IV, tail end of same worm highly magnified.

a, one of the three labial papillæ.
b, cephalic setæ.
c, pharynx.
d, lateral organ.
e, posterior end of œsophagus.
f, blind end anterior testicle.
g, junction of testicles.
h, blind end posterior testicle.
i, *j*, ventral accessory organs (?).
k, left spiculum.
l, anus.
m, anus.

as the length of the spicula, and the second is twice as far from the anus as the first. These are probably accessory sexual organs, and a secretion appears to have flowed from each of them. I could make out nothing concerning the internal structures connected with these swellings, and cannot state positively that they are not slight breaks in the skin caused by the hot sublimate in which the specimen was plunged for fixation. The testicles are situated in the third fourth of the body.

Hab.—Marine sand, Bay of Naples, 1888.

VI. MONHYSTERA, Bastian.

1. MONHYSTERA DIPLOPS, n.sp. $\frac{1\cdot \quad 10\cdot \quad 17\cdot \quad -62\cdot^{34} \quad 84\cdot}{2\cdot2 \quad 3\cdot4 \quad 3\cdot5 \quad 4\cdot2 \quad 3\cdot}$ ·9 mm. I have had great interest in examining this beautiful and active little animal. It is so small that all its organs can be examined without difficulty, and yet, notwithstanding its small size, it is one of the most perfectly developed of all the Monhysteras. Its transparent skin seems quite destitute of markings, but bears short inconspicuous hairs throughout the length of the body. The neck is conoid, and terminates anteriorly in a sub-truncate head, whose setæ, six in number, are about one-fourth as long as the diameter of the anterior part of the neck, though they are somewhat longer on the male. Each of the six lips bears a papilla. The distance of the circular lateral organs from the anterior extremity of the worm is about equal to the width of the head; the organs themselves are only one-fifth as wide as the head. Two reddish-brown spherical eyes are situated in the dorsal submedian region, just behind the bottom of the pharynx, nearly opposite the lateral organs. The simple conoid pharynx extends to nearly opposite the lateral organs. The anterior three-fourths of the cylindroid œsophagus is only one-half as wide as the neck; in the remaining part, however, it gradually expands to two-thirds the width of the neck. The lining of the œsophagus, when seen in optical section, is conspicuously crenate. The slightly brownish intestine, separated from the œsophagus by a deep and distinct constriction, is three-fourths as wide as the body. The transparency of the cardiac region renders it possible to see the relatively large and deep cardia very plainly. The food seems to

consist largely, if not exclusively, of diatoms, several species of diatom-shells being nearly always discoverable in the digestive canal. The rectum is equal in length, in the female, to the anal body-diameter. The elongated post-cardiac ventral gland empties its excretion through a ventral pore situated opposite the lateral organs. The tail is conoid from the depressed anus; the secretion of the caudal glands finds exit at the slightly expanded naked and apiculate terminus. The depressed vulva leads to a vagina one-half as long as the body is wide. The uterus rarely contains more than a single egg,—unsegmented,—about as long as the body is wide and one-half as wide as long. The blind end of the ovary lies about as far behind the cardiac constriction as the nerve-ring is in front of it.

$$\frac{1\cdot \quad 7\cdot \quad 15\cdot \quad \text{—M} \quad 85\cdot3}{1\cdot8 \quad 3\cdot \quad 3\cdot3 \quad 4\cdot \quad 3\cdot}\ \cdot8\text{ mm.}$$

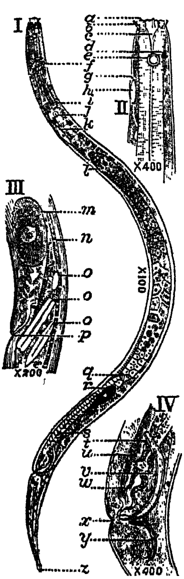

Fig. 8.—*Monhystera diplops.*

I, male worm. II, and IV, head and anal region of the same worm more highly magnified. III, portion of the body of a female, showing the vulva.

a, lip.
b, cephalic seta.
c, pharynx.
d, eye.
e, lateral organ.
f, nerve-ring.
g, excretory pore.
h, ampulla.
i, posterior end œsophagus.
j, cardia.
k, ventral gland.
l, blind end of testicle.
m, egg.
n, intestine.
o, *o*, *o*, diatoms in intestine.
p, vulva.
q, junction of vas deferens and ejaculatory duct.
r, one of the caudal glands.
s, ejaculatory duct.
t, proximal end left spiculum.
u, posterior part of ejaculatory duct.
v, shaft, left spiculum.
w, rectum.
x, anus.
y, accessory piece.
z, terminus.

The tail of the male is precisely like that of the female, if we except its tendency to be ventrally arcuate. The two equal linear almost uniformly arcuate spicula, twice as long as the anal body-diameter, are of uniform size, the proximæ being remarkable, not on account of any expansion or contraction as is often the case, but on account of the rather sudden straightening of those parts of the spicula; finally it is to be noticed that the middle parts of the spicula are situated well toward the dorsal side of the body. The accessory pieces are one-fourth as long as the spicula, and when seen in profile are somewhat hammer-shaped, being of the sort that possess a backward pointing process, which is here arcuate. The ejaculatory duct begins at a distance from the anus equal to twice the length of the tail. It is possible that a pre-anal row of gland-outlets exists on the male, but I could make out nothing very definite. The caudal glands are three in number, and are situated, one behind another, some distance in front of the anus.

This vivacious little worm is common in Port Jackson, New South Wales, Australia (1892), on marine algæ and in sea-sand at their base wherever the water is not foul. Its movements are of the most active kind; for a time it will wriggle so rapidly as to be almost invisible, then, without an instant's notice, come to a perfect standstill with lightning-like rapidity, lie for some time as if dead, then suddenly resume activities. It seems to be almost wholly diatomivorous, and is able to swallow with ease a diatom nearly half as long as its own neck and one-fourth as wide—a veritable sword-swallower. The frustules of the diatoms appear never to be digested.

2. M. BREVICOLLIS, n.sp. $\frac{\cdot 2 \quad 5\cdot \quad 9\cdot \quad -59\cdot^{25} \quad 76\cdot}{1\cdot \quad 1\cdot 5 \quad 1\cdot 9 \quad 2\cdot \quad 1\cdot 4}$ 1·7 mm. This is a species that needs further study before its character will be sufficiently known to settle its affinities. The cuticle is transversely striated and bears short and inconspicuous hairs. The neck is conoid and the head is somewhat rounded. The cephalic setæ are ten in number, those of each submedian pair being of unequal size; in addition there are numerous subcephalic setæ, prominent among them being four long and slender submedian ones, situated as far behind the lateral organs as the latter are behind the anterior extremity of the body. There are three pairs of transparent confluent lips. The circular lateral organs are one-third as wide as the neck. The simple pharynx is excessively small. The œsophagus is one-half as wide as the neck and is separated from the intestine by a shallow but distinct constriction. The intestine, whose contents are manifestly of vegetable origin, is composed of cells packed closely with granules without a tessellated arrangement. The ventral excretory pore appears to

be situated near the broad and oblique nerve-ring. The anterior half of the tail is conoid; thence it is narrow and cylindrical, being about one-eighth as wide as at the slightly elevated anus. The terminus, which is only very slightly swollen, bears three long hairs near the outlet of the caudal glands. The region about the vulva is slightly elevated. The vagina is four times as long as the body is wide. The eggs, which are three times as long as the body is wide and only one-fourth as wide as long, are deposited before segmentation begins. The spermatozoa seen in the uterus appeared to be spherical and one-fourth as wide as the body of the female.

Hab.—Found in sea-sand near low-tide mark, Port Jackson, New South Wales, Australia, 1893.

3. M. LATA, n.sp. $\frac{1\cdot \quad 9\cdot \quad 24\cdot \quad -65\cdot \quad 82\cdot}{2\cdot2 \quad 3\cdot3 \quad 4\cdot \quad 5\cdot \quad 3\cdot}$ 1·64 mm. The transversely striated cuticle of this plump and graceful little worm bears throughout the length of the body none but short and inconspicuous hairs. The truncate head surmounts a conoid neck, from which it is set off by slight expansion. The circle of cephalic setæ is arranged somewhat behind the anterior margin of the head, each seta being about two-thirds as long as the head is wide. The mouth is surrounded by six large transparent confluent lips, each of which bears a papilla. Circular lateral organs, one-fourth as wide as the head, are placed on the neck at a distance from the anterior extremity equalling their own width four times over. The oblate anterior and larger part of the pharynx has a depth half as great as the diameter of the head; thence the pharynx tapers abruptly. The œsophagus, which is one-half as wide as the neck, and whose lining when seen in optical section presents a sinuous appearance, is separated from the brownish intestine by a distinct cardiac constriction. The cardiac region being transparent, the large cardia can be distinctly seen, and behind it a rather distinct cardiac cavity. The intestine, whose cells are packed with granules giving rise to a rather dense tessellation, often contains among other vegetable matter a quantity of diatoms. From the depressed anus the tail, which bears a

considerable number of hairs, especially ventrally submedian ones, is conoid to the slightly expanded three-haired terminus, where the very sticky secretion of the caudal glands finds exit.

$\frac{1\cdot\quad 10\cdot\quad 23\cdot\quad —\mathrm{M}\quad 84\cdot}{1\cdot9\quad 2\cdot9\quad 3\cdot6\quad 4\cdot2\quad 2\cdot9}$ 1·6 mm. Except for being somewhat shorter and arcuate, and possessing a rather prominent anus, the tail of the male is precisely like that of the female. The two equal linear spicula are of uniform size, being curved in the middle and having a length one and a half times as great as the anal body-diameter; their proximæ are cephalated by expansion. The accessory pieces are one-half as long as the spicula and have their proximal ends expanded. Two long submedian hairs occur opposite each other just in front of the anus.

Hab.—This Nematode is not uncommon in marine sand and mud, Port Jackson, New South Wales, Australia, 1893.

4. M. SETOSISSIMA, n.sp. $\frac{\cdot8\quad 6\cdot7\quad 17\cdot\quad —57\cdot^{20}\quad 81\cdot}{1\cdot9\quad 3\cdot4\quad 3\cdot9\quad 3\cdot8\quad 2\cdot8}$ 1·41 mm. This remarkable form presents simple transverse striæ, resolvable with moderate powers. Throughout the length of the body the cuticle bears numerous slender hairs, whose length is about equal to three-fourths the width of the body. The cephalic setæ are particularly numerous, the larger ones being much stouter and longer even than those found on the body. The cephalic row of setæ is situated near the anterior margin of the head, and must not be confounded with the four pairs of subcephalic setæ growing close by; these latter are only half as long as the largest of the true cephalic hairs. The longest hairs in the true cephalic row are, as usual, the submedian ones; of these there are eight, all of equal length, growing in pairs, one pair on each submedian line. Next in size to these, and almost as long, are four sublateral hairs; these grow one on either side of each lateral line. Alternating with these and with the submedian pairs are eight very much shorter hairs. Thus it will be seen that the full complement is twenty hairs. Add to these the four pairs of subcephalic setæ, and we have in all twenty-eight hairs. To what end, one naturally asks, has this armature been developed? Most probably these hairs are tactile and serve to guide the worm in its peregrinations

among the particles of the sand in which it lives. The great length of the cephalic hairs is a frequent characteristic of sand-inhabiting species. I am uncertain about the nature of the lips, but the mouth is capacious and in form like that of other species of *Monhystera.* The distance of the circular lateral organs from the anterior extremity is about equal to twice the width of the head; they have a central fleck and are one-third as wide as the forward part of the neck. The œsophagus, which is two-thirds as wide as the neck, presents a distinct chitinous lining and is separated from the intestine by a shallow but distinct constriction. The rather thick-walled intestine is two-thirds as wide as the body. The ventral excretory pore is situated somewhat behind the oblique nerve-ring; the unicellular gland, for which it serves as the outlet, lies behind the cardiac region. The lateral fields are one-third as wide as the body. The anterior half of the tail is conoid; thence it is cylindrical and one-fourth as wide as at the anus. The terminus is scarcely expanded and bears two hairs, each one-half as long as the tail. Caudal glands are present. Both the anus and the vulva are slightly depressed. The eggs are one-half as wide as the body, and somewhat longer than wide; they are deposited before segmentation begins.

$\frac{\cdot7 \quad 7\cdot4 \quad 16\cdot \quad -M \quad 84\cdot}{1\cdot6 \quad 3\cdot1 \quad 3\cdot2 \quad 3\cdot7 \quad 2\cdot9}$ 1·5 mm. The two equal linear spicula are of nearly uniform size throughout, their proximæ being scarcely cephalated; they are slightly bent near the middle and are one and one-third times as long as the anal body-diameter. The obscurely sigmoid accessory pieces are two-thirds as long as the spicula, the plane in which they may be said to lie being perpendicular to the body axis. In the distal half they are parallel to the spicula; thence they curve away from the spicula. The blind end of the testicle lies as far behind the cardia as the latter is behind the nerve-ring. The anal region is elevated.

Hab.—This worm is not uncommon about Port Jackson, New South Wales, Australia, 1893, in marine mud and sand.

5. M. GRACILLIMA, n.sp. $\frac{1\cdot \quad 7\cdot4 \quad 19\cdot \quad -68\cdot^{83} \quad 86\cdot}{1\cdot5 \quad 2\cdot1 \quad 2\cdot5 \quad 3\cdot \quad 2\cdot}$ 1·7 mm. This exceedingly graceful and fascinating species is characterised by

the numerous long and delicate hairs that occur throughout the length of the body ; these hairs are about three-fourths as long as the greatest diameter of the body. The thin cuticle is transversely striated. The neck is conoid, and ends in a slightly expanded truncate head, which bears ten setæ, each about one-third as long as the head is wide, those of the submedian pairs being a little unequal in size. Each of the six large confluent lips bears a single minute papilla. The circular lateral organs, one-third as wide as the head, are situated at a distance from the anterior extremity equal to twice the width of the head. Eyes are lacking. The large pharynx is pretty nearly balloon-shaped. The cylindroid œsophagus is one-half to two-thirds as wide as the neck, the lining appearing sinuous when seen in optical section. The brownish intestine is two-thirds as wide as the body, and the cells of which it is composed contain granules which are so arranged as to give rise to an obscure tessellation. The length of the curved rectum is equal in the female to the anal body-diameter. The nature of the ventral gland remains unknown, but the ventral pore, its outlet, is situated opposite the posterior border of the lateral organs. The tail is conoid from the depressed anus, and ends in a rounded outlet for the secretion of the caudal glands. The vulva is large, and near it lies a large transparent organ, most likely a glandular structure; the oblique vagina is one-half as long as the body is wide. The eggs are elongated,—somewhat longer than the body is wide, and less than half as wide as long. There appears to be no posterior branch to the female sexual apparatus.

$\frac{\cdot 8}{1\cdot 5}\;\frac{8\cdot}{2\cdot}\;\frac{20\cdot}{2\cdot 4}\;\frac{-\mathrm{M}}{2\cdot 6}\;\frac{90\cdot}{2\cdot 2}\;1\cdot 5\,\mathrm{mm.}$ The male tail resembles that of the female, except that the anus is elevated ; the whole posterior part of the male is inclined to be ventrally arcuate or even coiled. The two equal pointed linear spicula are arcuate in the middle, and present proximal ends cephaloid by expansion and bent dorsally ; they are somewhat less than twice as long as the anal body-diameter. The accessory pieces are of the kind presenting a backward pointing process, which here seems, when seen in profile, to lie at an angle of forty-five degrees with the body axis, and to extend somewhat more than half-way across the body.

Apparently there exists a ventral row of pre-anal supplementary organs of small size, but they were only to be seen dimly.

Hab.—I found this species inhabiting mud and sand at Neutral Bay, Port Jackson, New South Wales, Australia. 1893. It appeared to be common.

6. M. AUSTRALIS, n.sp. $\dfrac{1\cdot\quad 7{\cdot}8\quad 20\cdot\quad \text{—}58\text{—}^{38}\quad 78\cdot}{2\cdot\quad 2{\cdot}8\quad 3{\cdot}1\quad 3{\cdot}1\quad 2{\cdot}1}$ 1·32 mm. The thin transparent cuticle presents faint and fine transverse striæ, and bears inconspicuous hairs throughout the length of the body. The conoid neck terminates in a somewhat rounded head bearing ten setæ arranged in the usual manner. The lip-region is transparent and the lips themselves are one-half as high as the head is wide, and are destitute of papillæ. The circular lateral organs are one-third as wide as the head, and are removed from the anterior extremity a distance twice as great as the width of the head. The pharynx, broad opposite the lips, narrows thence, and ends half-way to the lateral organs, and is therefore comparatively large. The œsophagus in its anterior part is two-thirds as wide as the corresponding part of the neck; posteriorly the neck widens, and there the œsophagus is consequently only one-half as wide as the neck. The lining of the œsophagus is distinctly to be seen. The thick-walled intestine begins at once at the distinct cardiac collum to be wider than the œsophagus—namely, three-fourths as wide as the body. The cardia is not large, but is distinct. The cells of the intestine, as usual, contain numerous granules. The rectum in the female is as long as the anal body-diameter. The nature of the ventral gland is unknown to me. The nerve-ring encircles the œsophagus squarely. The tail is conoid from in front of the inconspicuous anus, and ends in a slight expansion bearing two hairs near where the secretion of the caudal glands is poured out. The length of the vagina is equal to half the width of the body, and it ends outwardly in an inconspicuous vulva. The eggs are half as wide as the body and three times as long as wide. The smaller posterior ovary reaches nearly half-way to the anus; the anterior ovary ends at three-fourths the distance from the vulva to the cardiac constriction. The male has not been seen.

Hab.—Found in sea-sand, near low-tide mark, Port Jackson, New South Wales, Australia, 1893.

VII. BATHYLAIMUS, new genus.

This genus is apparently related to *Oncholaimus.* The mouth-cavity is large and two-chambered, the posterior chamber being much the smaller, but there is an entire absence of the teeth characteristic of *Oncholaimus.* The lips are converted into powerful grasping organs armed with tactile hairs. The three caudal glands are small, and are confined to the tail. The rather short equal spicula are enlarged at the distal extremity and slide in guides of unusual size. The ductus empties through a distinctly chitinous outlet. The testicle has a segmented appearance owing to the peculiar way in which the spermatozoa are developed.

B. AUSTRALIS, n.sp. $\frac{2\cdot5 \quad 6\cdot3 \quad 17\cdot \quad {}^{\backprime}51^{,20} \quad 94\cdot}{1\cdot4 \quad 1\cdot6 \quad 1\cdot8 \quad 2\cdot4 \quad \cdot9}$ 2·mm. The thin transparent skin is destitute of striæ, but bears hairs throughout the length of the worm, those on the head and at the end of the tail being the more conspicuous on account of their greater length. The conoid neck terminates in a head somewhat rounded in front and bearing, somewhat in front of the middle of the anterior part of the pharynx, twelve setæ arranged as follows: one long one on each lateral line; a long one and a short one on each of the four submedian lines. The larger of these setæ are somewhat longer than the head is wide. Each of the three lips is bidentate at the extremity, and armed just below the summit with two curved hairs which project forward

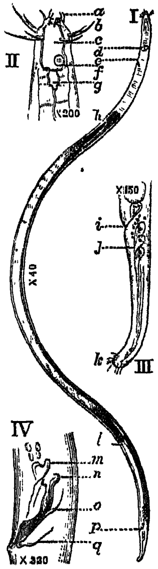

FIG. 9.—I, male of *Bathylaimus australis.* II, III, and IV, the head, tail, and anal region of the same worm more highly magnified.

a, labial setæ.
b, cephalic setæ.
c, pharynx.
d, nerve-ring.
e, excretory pore.
f, lateral organ.
g, posterior chamber of pharynx.
h, blind end of testicle.
i, anus.
j, three caudal glands.
k, hairs at terminus of tail.
l, posterior end of testicle.
m, beginning of cloaca or rectum.
n, proximal end of spiculum.
o, *q*, accessory piece.
p, anus.

and inward,—manifestly tactile hairs. The lateral organs are one-sixth as wide as the head; they appear to be circular with a central button, but are really spiral, and are situated as far behind the cephalic setæ as the latter are behind the mouth. There are no eye-spots. The pharynx is double, the anterior chamber being half as wide as the head and twice as long as wide, and the posterior chamber being half as wide and one-fourth as long as the anterior part. Both chambers are tolerably uniform in diameter, but the anterior expands a little in the region of the cephalic setæ. The conoid œsophagus is separated from the intestine by a distinct but not deep cardiac collum. The intestine is three-fourths as wide as the body, and its thin wall is built of small cells of such a size that about sixteen side by side make the circumference. The intestine commonly contains what appears to be vegetable matter. The length of the rectum equals that of the anal diameter of the body. There is a ventral gland. The nerve-ring is slightly oblique. The slightly incurved tail ends in a blunt rounded terminus one-third as wide as the base of the tail. The three small caudal glands are confined to the tail.

$\frac{2{\cdot}5 \quad 6{\cdot} \quad 18{\cdot} \quad \text{—M} \quad 95{\cdot}}{1{\cdot}4 \quad 1{\cdot}6 \quad 1{\cdot}7 \quad 2{\cdot} \quad 1{\cdot}5}$ 2·mm. The tail of the male closely resembles that of the female. There is no bursa or other supplementary organ, and apparently no papillæ. The two equal linear spicula are slightly bent near the middle, and are enlarged near the pointed distal extremity; they are one and one-third times as long as the anal body-diameter, or about one-third as long as the tail, and their proximæ are cephaloid by expansion. The large accessory pieces are three-fourths as long as the spicula and are in contact with them in the distal half. The narrow ejaculatory duct is three times as long as the tail, and has a chitinous outlet parallel with the spicula. The spermatozoa appear to develop in batches, and the testicles, therefore, present a peculiar appearance,—as if separated by thick transverse walls into a number of chambers, or as if in a manner segmented.

Hab.—Port Jackson, New South Wales, Australia, 1891.

VIII. SYNONCHUS, new genus.

The worms constituting this genus are also related to *Oncholaimus*. They have a pharynx armed with teeth of which the dorsal is prominent and the submedian rudimentary. The pharynx is so small that the teeth occupy most of the available space when the mouth is closed. The œsophagus contains the three glandular structures first seen by Marion in the œsophagus of *Enoplus*, and afterwards fully described and elucidated by de Man in *Oncholaimus*. In *Synonchus* the dorsal gland has the peculiarity of emptying into the lumen of the œsophagus at some distance from the mouth, a fact which adds weight to the opinion that these organs are salivary glands. The only other function that has occurred to me as possibly assignable to these organs is that of secreting a venomous fluid. The sexual organs, so far as known, are symmetrical in both sexes. The males possess a ventral accessory organ in front of the anus. I failed to find in the only female examined the tubular organs discovered by de Man in the females of *Oncholaimus*.

1. S. FASCICULATUS, n.sp. $\dfrac{2\cdot \quad 5{\cdot}7 \quad 19\cdot \quad \text{‘}60\text{’}^{23} \quad 97\cdot}{{\cdot}6 \quad 1{\cdot}2 \quad 1{\cdot}3 \quad 1{\cdot}4 \quad {\cdot}9}$ 8·8 mm. is the formula for the only female seen—probably a smallish one. The subcuticula is very finely transversely striated. Short hairs occur on all parts of the body, but near the head they are particularly abundant and are arranged in a fasciculate manner. The conoid neck terminates anteriorly in a truncate head, surrounded opposite the base of the narrow pharynx by the usual row of ten cephalic setæ,—one on each lateral line and two on each submedian line, all of about equal length, namely, one-third as long as the head is wide. The three lips are rather indistinct, but plainly they close together over the pharynx, which presents a single sharp dorsal tooth half-way up and two rudimentary teeth at the base. The dorsal salivary gland empties into the lumen of the œsophagus at one-fourth the distance from the mouth to the nerve-ring. The œsophagus is at first one-half as wide as the neck and gradually enlarges until finally it becomes two-thirds as wide as the neck. The cardiac collum is distinct. The thick-walled intestine is

one-half as wide as the body, and is composed of small cells of such a size that it takes about sixteen to build the circumference. I could discover no ventral gland. The lateral fields are one-third as wide as the body. The tail is conical in the anterior third, and continues thence, cylindrical—and one-third as wide as at the anus,—to the swollen terminus. The three elongated caudal glands are confined to the tail. The vulva is large and somewhat prominent. The eggs are thin-shelled and more than twice as long as the body is wide, and only one-fifth as wide as long. The ovaries extend three-fourths the way back to the vulva, and contain about a dozen developing ova.

$\frac{\cdot2 \quad 5\cdot \quad 16\cdot \quad -\mathrm{M}-^{17} \quad 97\cdot3}{\cdot4 \quad \cdot8 \quad 1\cdot \quad 1\cdot \quad \cdot8}$ 11·-13·mm. The tail of the male resembles that of the female in form, but the caudal glands, instead of being confined to the tail, extend forward beyond the anus a distance equal to the length of the tail; like those of the female they are much elongated. There is an accessory sexual organ placed ventrally and opposite the proximal ends of the spicula. The latter are equal, linear, slightly and uniformly arcuate, and are slightly expanded at the proximal end; they are half as long as the tail and slide in accessory pieces nearly half as long as they themselves are. The accessory pieces are supported by a process which extends from the anus halfway across the body. Two irregular rows of submedian hairs become prominent opposite the spicula and on the tail; there are

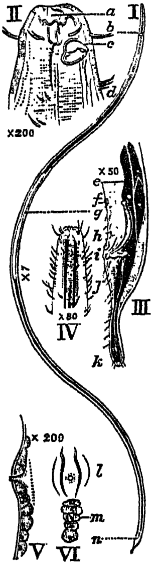

FIG. 10.—*Synonchus fasciculatus.*

I, male worm. II, head, and III, tail of the same worm more highly magnified. IV, head of a young worm, ventral view, to show the three glands (drawn black) inside the œsophagus, one of which empties into the œsophagus tube far behind the other two. V and VI, lateral and ventral views respectively of the male accessory organ.

a, pharynx.
b, nerve-ring.
c, lateral organ.
d, beginning of the intestine.
e, caudal glands.
f, accessory organ.
g, junction of the two testicles.
h, subventral hairs or papillæ.
i, anus.
j, hairs.
k, terminus.
l, ventral organ.
m, cells of same.
n, anus.

fifteen or twenty such hairs in each row, of which the larger and the larger number occur in front of the anus. The testicles are short, and occur in the second fourth of the body.

Hab.—Marine sand, Bay of Naples, 1888.

2. S. HIRSUTUS, n.sp. Female unknown.

$\frac{\cdot 2 \quad 5\cdot \quad 16\cdot \quad -\mathrm{M}-^{14} \quad 97\cdot}{\cdot 4 \quad \cdot 7 \quad \cdot 8 \quad \cdot 8 \qquad \cdot 8}$ 12·8 mm. The subcuticula is very finely and obscurely striated. Long slender hairs occur throughout the length of the body, but are specially abundant on the anterior part of the neck. The ten cephalic setæ are arranged as in *fasciculatus*, but are here easily confounded with the hairs of the neck growing near by. The neck is cylindrical, and terminates in a truncate-conical head. The three lips surround a narrow mouth which leads into a short narrow pharynx containing a single small dorsal tooth. The circular lateral organs occur opposite the base of the pharynx, and are one-third as wide as the head. There are no organs of vision. The œsophagus is at first two-thirds as wide as the neck, but soon becomes reduced to one-half as wide as the neck and so continues. The two submedian salivary glands empty into the pharynx; I did not discover the outlet of the dorsal gland. The intestine is separated from the œsophagus by a distinct constriction, and is thick-walled and one-half as wide as the body. The cardia is very large and long. The cells of the intestine are of such a size that six build the circumference. I could find no ventral gland. The lateral fields were one-third as wide as the body. The tail constructed as in *fasciculatus*, but the elongated caudal glands are here confined to the tail, in the male at least. Supplementary organ and hairs situated precisely as in *fasciculatus*, but the hairs less conspicuous. The spicula are not so slender as in *fasciculatus*, and are one-third as long as the tail, and they are supported by accessory pieces having a more prominent posterior process.

Hab.—Marine sand, Bay of Naples, 1888.

IX. LAXUS, new genus.

Laxus is a genus of short-necked, slender and flexible worms, inhabiting marine sand; they are usually much coiled and slow of motion, and are, therefore, readily recognised. I have seen only the male of one species and the female of a second. The female of *L. contortus* has two symmetrically reflexed ovaries. The male of *L. longus* seems to have but a single testicle. There are no eyes.

1. L. CONTORTUS, n.sp. $\frac{\cdot 4 \quad 1\cdot 3 \quad 2\cdot 4 \quad {}'50\cdot^{37} \quad 97\cdot 8}{\cdot 4 \quad \cdot 4 \quad \cdot 4 \quad \cdot 5 \quad \cdot 3}$ 4·7 mm. The cuticle, which bears very inconspicuous hairs throughout, is traversed by very fine plain transverse striæ. The cylindrical neck terminates in a truncate head whose anterior margin bears six slender setæ, each as long as the head is wide. The spiral lateral organs are circular in appearance; they are one-fourth as wide as the head, and their anterior margins are opposite the bases of the cephalic setæ. The mouth is a shallow depression in the middle of the front of the head, and leads to a straight closed pharynx, indistinguishable from the œsophagus but for an almost imperceptible pharyngeal swelling, which in its widest part is one-third as wide as the head. The œsophagus is a tube only one-fifth as wide as the neck, but it expands at the posterior end to form a powerful, nearly spherical, sucking bulb three-fourths as wide as the neck. The cardiac collum is distinct, and leads to an intestine whose diameter is at first very small, and nowhere exceeds one-third the width of the body. The cells of the intestine are large, two to three building the circumference, and contain numerous brown granules. The rectum is longer than the anal body-diameter. The nature of the ventral gland is unknown to me. The lateral fields are probably one-half as wide as the body. The nerve-ring is oblique. The three caudal glands are confined to the tail, and their secretion has exit at the blunt terminus. The tail is conoid, being about half as wide at the terminus as at the anus. The reflexed portion of the ovaries extends about one-third the way back to the vulva. The thin-shelled eggs are arranged in a single row and fill the body cavity well up; they are four to five times as long as wide, and are apparently deposited before segmentation begins. Male unknown.

Hab.—Marine sand, Bay of Naples, 1888.

2. L. LONGUS, n.sp. Female unknown.

$\frac{\cdot 5 \quad 1\cdot 2 \quad 2\cdot \quad (?)\text{—M} \quad 98\cdot 4}{\cdot 5 \quad \cdot 6 \quad \cdot 6 \quad \cdot 7 \quad \cdot 8}$ 6·4 mm. The finely and plainly striated cuticle bears hairs throughout. The neck and head closely resemble those of the preceding species, but the cephalic setæ number at least eight (possibly ten), there being two setæ of unequal size placed on each submedian line; the setæ are of the same long, slender and flexible structure found in *contortus*. The lateral organs are manifestly spiral, the left being a right-handed spiral and the right a left-handed spiral; they are one-third as wide as the head, and are situated opposite the cephalic setæ on the margin of the head. The mouth and pharynx are more pronounced than in *contortus*, the former being a conoid depression with transverse chitinous ridges, and the latter being situated in a swelling more than one-third as wide as the neck. The œsophagus is one-fourth as wide as the neck, and expands posteriorly into a spherical bulb three-fourths as wide as the neck. The cardiac collum is distinct. The intestine, one-half as wide as the body, is composed of cells of such a size that two to three build the circumference; as in *contortus*, the cells contain brown granules. The nature of the ventral gland is unknown to me. The lateral fields are one-third as wide as the body. The nerve-ring, as in *contortus*, is oblique. The ventrally-arcuate conoid tail has a blunt rounded terminus, and presents five pairs of equidistant hairs on the ventral surface of the middle part. At the same distance from the anus, but in front of it, occur also five or six similar pairs of hairs. The two equal linear spicula

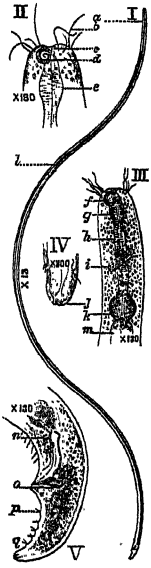

FIG. 11.—I, male of *Laxus longus*. II, III, IV, and V, the head, neck, tail-end, and anal region of the same more highly magnified.

a, hind end of œsophagus.
b, cephalic seta.
c, pharynx.
d, left lateral organ.
e, pharyngeal bulb.
f, lateral organ.
g, pharyngeal swelling.
h, œsophagus.
i, nerve-ring.
j, outlet for caudal glands.
k, cardiac bulb.
l, blind end of testicle.
m, intestine.
n, proximal end spiculum.
o, accessory piece.
p, *q*, postanal ventral papillæ.

are a little more than half as long as the tail, and are arcuate in the distal half; their proximal ends are cephaloid by expansion. The substantial accessory pieces are half as long as the spicula, and appear to be situated at right angles to the axis of the body.

Hab.—Marine sand, Port Jackson, New South Wales, Australia, 1890.

X. Chromagaster, new genus.

The *Chromagasters* are slender slow-moving dark-coloured worms inhabiting marine mud and sand. They have a short neck, mitriform head, tubular pharynx, and very large circular lateral organs, and the sexual organs of both sexes are asymmetrical. The spicula of the males are supported by accessory pieces having a backward-pointing process.

1. C. nigricans, n.sp. Female unknown.

$\frac{\cdot 4 \quad 2{\cdot}3 \quad 5{\cdot} \quad \text{—M} \quad 97{\cdot}7}{\cdot 6 \quad \cdot 8 \quad \cdot 8 \quad 1{\cdot} \quad \cdot 9}$ 4·58 mm. The skin is traversed by about three thousand plain transverse striæ, and bears hairs throughout, but these latter are conspicuous only near the extremities. The cylindroid neck terminates in a mitriform head armed with two rows of slender and flexible setæ. The posterior row of six setæ encircles the head just in front of the large circular lateral organs; of the setæ in this row one seems to be dorsal, one ventral, and the other four submedian. The anterior row is situated half-way between the posterior row and the mouth, and appears to be composed of ten setæ arranged in the usual manner, that is, one on each lateral line, and two of unequal size on each submedian line. The largest of these cephalic setæ are as long as the head is wide. The projecting mouth is closely surrounded by six small pointed lips. The pharynx is unarmed and tubular and reaches as far back as the anterior border of the lateral organs. These latter are three-fourths as wide as the head and impart to the worm a peculiar appearance. There are no eyes. The tubular œsophagus is only one-third as wide as the neck, but expands in the posterior part to form an elongated bulb two-thirds as wide as the neck. The cardiac collum is distinct and narrow. The thick-walled intestine is three-fourths as wide as the body, and is composed of cells of such a size that about ten side by side make up the circumference.

These cells contain large dark-coloured granules, to which fact is due the blackish hue of the living worm. The ventral excretory pore is situated considerably behind the nerve-ring, the distance from the ring to the pore being about half as great as the distance from the pore to the cardiac region. There is a rather large ampulla and a widish duct; I could not make out the position of the gland of which they are the outlet. The tail is conical and slightly ventrally arcuate. I saw no caudal glands. There is no bursa or supplementary sexual organs other than several tactile hairs situated on the ventral side of the anterior half of the arcuate and conical tail. The two equal acute linear spicula are strongly arcuate and of nearly uniform diameter in the proximal half, but taper gradually to a point in the nearly straight distal half. They are twice as long as the anal body-diameter, or one-third as long as the tail, and are supported in action by accessory pieces having a process extending obliquely backward from near the anus.

Hab.—Marine sand, Bay of Naples, 1888.

2. C. PURPUREA, n.sp. $\frac{\cdot 2 \quad 1\cdot 2 \quad 2\cdot 3 \quad -78^{\cdot 43} \quad 99\cdot 7}{\cdot 3 \quad \cdot 4 \quad \cdot 6 \quad \cdot 9 \quad \cdot 4}$ 7·46 mm. The striæ if present are excessively fine. Hairs occur throughout the length of the body, but are conspicuous only near the extremities. The neck tapers a little more than in *nigricans*, and ends in a somewhat more distinct mitriform head, the constriction behind the lateral organs being quite noticeable. The cephalic setæ are arranged in two rows, the posterior row of four submedian setæ surrounding the head just in front of the large circular lateral organs, and the anterior row of eight being much nearer the mouth, and being placed so that two of unequal size occur together on each submedian line. The setæ are shorter, stouter and stiffer than in *nigricans*, the largest of them being only half as long as the head is wide. The lateral organs are four-fifths as wide as the head. The mouth does not project, and the lips are very inconspicuous. The apparently unarmed tubular pharynx extends back as far as the posterior margins of the lateral organs. There are no eyes. The tubular œsophagus is only one-fourth as wide as the neck, but gradually expands in its posterior fourth so as to form

a bulb three-fourths as wide as the base of the neck. The cardiac collum is narrow and distinct. The thick-walled intestine is three-fourths as wide as the body, and is composed of pigmented cells of such a size that about ten build the circumference. The intestine imparts a purple-madder colour to the living worm. The lateral fields are about one-third as wide as the body. The ventral excretory pore is situated just behind the nerve-ring. The duct is narrow, and the ampulla rather indistinct; I did not discover the location of the gland. The tail in young specimens is conical and arcuate, but in adults is nearly hemispherical. I saw no caudal glands. The vulva is not conspicuous. The uterus usually contains a row of eight to ten thin-shelled eggs, each about twice as long as the body is wide, and less than half as wide as long. They are evidently deposited before segmentation begins. The spermatozoa are of such a size that four side by side reach across the uterus. The eggs being white or translucent sometimes give the living worm a segmented appearance. The ovary usually contains a row of sixteen to twenty developing ova, besides the large number of very immature ova contained in the blind end.

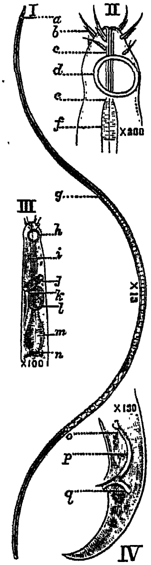

FIG. 12.—I, female *Chromagaster purpurea.* II, III, and IV, the head, neck, and anal region of the same worm more highly magnified.

a, posterior end of œsophagus.
b, cephalic setæ.
c, pharynx.
d, lateral organ.
e, beginning of œsophagus.
f, œsophagus.
g, blind end of ovary.
h, lateral organ.
i, œsophagus.
j, nerve-ring.
k, excretory pore.
l, unicellular gland (?).
m, cardiac bulb.
n, cardiac constriction.
o, proximal end left spiculum; also points out the vulva on the female.
p, shaft of spiculum.
q, accessory piece.

$\frac{\cdot 3\quad 1\cdot 3\quad 2\cdot 8\quad ?\text{—M}^{68}\quad 98\cdot 3}{\cdot 4\quad \cdot 5\quad \cdot 6\quad 1\cdot\quad \cdot 6}\ 6\cdot 41\text{ mm.}$ The tail of the male is conical and arcuate. There appear to be no caudal glands. There is no bursa or other supplementary sexual organ. The two equal slender spicula are uniformly arcuate, and are of nearly uniform size throughout; they are twice as long as the anal body-diameter and three-fourths as long as the tail. The accessory pieces are somewhat L-shaped.

Hab.—North Arm, Port Adelaide, South Australia, 1891.*

XI. SOLENOLAIMUS, new genus.

The worms of this genus are short-necked and possess a narrow tubular pharynx. The anterior half of the œsophagus is narrow and weak, but the posterior half is large and muscular. The female sexual organs are asymmetrical.

S. OBTUSUS, n.sp. $\frac{\cdot 2}{\cdot 3}\ \frac{\cdot 8}{\cdot 4}\ \frac{1\cdot 4}{\cdot 5}\ \frac{-59^{49}}{\cdot 8}\ \frac{99\cdot 4}{\cdot 4}\ 21\cdot 5\text{ mm.}$ The thick transparent skin is destitute of striæ. The hairs are papilla-like and occur throughout the length of the worm. The neck is conoid, the head is rounded. The short spike-shaped cephalic setæ are all submedian in position and are arranged in two circles; the posterior row is half-way between the lateral organs and the mouth, while the anterior is much nearer the mouth. The minute lips are supplied with papillæ or teeth. The circular (?) lateral organs are about one-sixth as wide as the head and are situated opposite the posterior end of the pharynx. The anterior half of the œsophagus is spindle-shaped and in its widest part one-third as wide as the neck; the muscular posterior half is three-fourths as wide as the neck. The central constriction is surrounded by the nerve-ring. The cardiac collum is distinct and the cardia large and prominent. The

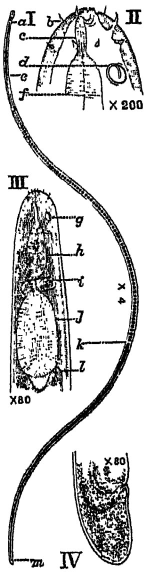

Fig. 13.—I, female of *Solenolaimus obtusus.* II, III, and IV, head, neck, and tail of the same worm more highly magnified.

a, posterior end of œsophagus.
b, cephalic setæ.
c, tubular pharynx.
d, lateral organ.
e, blind end of ovary.
f, œsophagus.
g, lateral organ.
h, œsophagus.
i, nerve-ring.
j, posterior swelling.
k, vulva.
l, cardiac collum.
m, anus.

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* Since writing the above on *Chromagaster* (most of it in 1888), I have read Dr. de Man's description of his new genus *Siphonolaimus*. There is great resemblance in our species, but they are beyond doubt distinct. The genera will probably have to be united. I have failed to clearly see the spear-like structure mentioned by Dr. de Man and also the accessory organs on the tail-end of the male.

intestine is three-fourths as wide as the body and is built of cells of such a size that ten side by side make up the circumference. I could discover nothing concerning the ventral excretory gland. The longitudinal fields are one-fifth as wide as the body and are finely striated longitudinally. The tail is sub-cylindroid and is rounded at the terminus. There are no caudal glands. The eggs are arranged in a single row in the uterus; the ova, on the other hand, are in two or three parallel rows. Male unknown.

Hab.—Marine sand, Bay of Naples, 1888.

XII. Fimbria, new genus.

F. tenuis, n.sp. Female unknown.

$\frac{\cdot 2 \quad 14\cdot 5 \quad 24\cdot \quad \text{—M—}^{50} \quad 93\cdot}{\cdot 3 \quad 1\cdot \quad 1\cdot 4 \quad 1\cdot 6 \quad \cdot 9}$ 1·48 mm. The cuticle is not striated. Hairs abound on the tail, but are not conspicuous elsewhere. The neck is conoid to the slightly expanded naked head, which is rounded in front and contains a simple prismoid pharynx nearly half as wide as the head itself. The mouth is surrounded by minute bristles or bristle-bearing papillæ. The œsophagus, at first only one-half as wide as the neck, becomes in the cardiac region three-fourths as wide as the neck. The cardia is large and stains deeply with carmine; the cardiac constriction is deep. The intestine is three-fourths as wide as the body, and is composed of cells of such a size that six side by side build the circumference. The lateral fields contain scattered pigment granules. The ventral gland consists of a large elongated cell, situated as far behind the

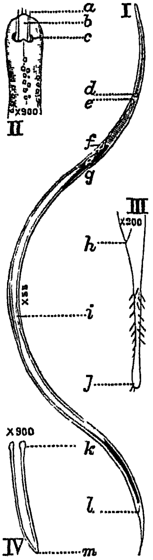


Fig. 14.—I, male of *Fimbria tenuis*. II, III, and IV, head, tail, and spiculum of the same worm more highly magnified.

a, cephalic setæ.
b, pharynx.
c, organ of unknown function.
d, nerve-ring.
e, excretory pore.
f, cardiac constriction.
g, ventral excretory gland.
h, anus.
i, junction of the two testicles.
j, terminus of tail.
k, proximal end of spiculum.
l, anus.
m, distal end of spiculum.

cardia as the nerve-ring is in front of it, and pouring its excretion through a long duct whose outlet is a large ampulla and ventral pore just behind the nerve-ring. This latter encircles the œsophagus squarely. The tail is conoid to the slightly swollen terminus, its posterior two-thirds being covered with hairs. The length of the two equal nearly straight pointed spicula is about equal to the anal body-diameter; their proximæ are barely cephaloid. The accessory pieces are nearly as long as the spicula, are joined distally, and are capable of being extruded along with the spicula. There is no supplementary organ or bursa. The point where the testicles join is somewhat behind the middle of the body. The food is vegetable.

Hab.—Seaweed, Island of Ceylon, 1889.

CONTRIBUTIONS TO A REVISION OF THE TASMANIAN LAND MOLLUSCA.

By Henry Suter, Christchurch, New Zealand.

(Communicated by C. Hedley, F.L.S.)

NOTES ON THE OCCURRENCE OF A SPECIES OF *PLECOTREMA* AND OF OTHER SPECIES OF MOLLUSCA IN PORT JACKSON.

By J. C. Cox, M.D., F.L.S., C.M.Z.S.

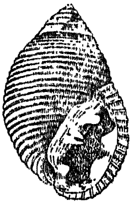
An interesting addition to the known fauna of Port Jackson lately occurred to me, in *Plecotrema octanfracta*, Jonas. This species appears to possess some unusual facilities for wandering, which it shares with other *Auriculidæ*, and with *Truncatella*, for it has been observed in the Sandwich, Paumotu, Gambier, Tonga, Samoa, Fiji, and New Caledonia Islands, though not hitherto recorded from Australia, nor from any extra-tropical station. It is not noticed from Port Jackson in the lists of Angas or of Whitelegge, but Pfeiffer has described as from Port Jackson a *Plecotrema bicolor* (Mon. Auric. p. 103 : B. M. Cat. Auriculidæ, p. 78) doubtless the species under discussion. A species, probably allied to this, *P. ciliata*, Tate, is quoted in Adcock's "Hand-List of the Aquatic Mollusca inhabiting South Australia."

The earliest description appears to be that by Jonas in the Zeit. Malak. 1845, p. 160. Garrett redescribed the species in P.Z.S. 1887, pp. 295-6, and figured it under the name of *P. consobrina* (Proc. Phil. Acad. Nat. Sci. 1873, pl. III, fig. 69). The members of this genus do not seem to have been discriminated in a satisfactory manner. Messrs. H. and A. Adams published in 1853 (P.Z.S. pp. 120-3) the definition and a monograph of the genus, based chiefly upon the material contained in the Cuming Collection. To one not possessing access to the types in the British Museum this paper is of slight value. No figures are attached, many species are unlocalised, the descriptions are brief and without measurements, and finally, Jonas's *Pedipes octanfracta* is entirely omitted.

In determining the Port Jackson shell as *P. octanfracta,* I am guided chiefly by Garrett's description and figure, as well as by a careful comparison with examples from various Polynesian islands. That others may form an independent opinion on the matter, I add a figure, drawn for me by Mr. Hedley, and give a full description of the shell now recorded.

Possibly to the synonymy quoted by Garrett, viz., *clausa,* H. and A. Adams, and *consobrina,* Garrett, it will be found necessary to add *lirata* and *concinna,* both of H. and A. Adams.

Description.—Shell ovate, the periphery coincident with the posterior end of the varix, rounded anteriorly, acuminate posteriorly; colour pale purplish-brown, with a darker stripe beneath the suture and a lighter band beneath that again. Whorls 7½, the upper ones together composing one-third of the shell's total length, nearly flat-sided, the last sloping to the periphery, thence rounded to the base. Sculpture: the body whorl encircled by nineteen strong projecting revolving ridges, which cross the varix and abruptly terminate at the aperture, the ridges being half the breadth of the interstices; the penultimate and the antepenultimate whorls have each five revolving ridges; the earlier whorls are worn smooth. Suture channelled. Umbilicus funnel-shaped, about as deep as wide, and about a sixth of the shell's diameter across, surrounded by a double ridge which terminates with the varix, abruptly descending, and lirate within. Aperture one-half the length of the shell, narrow, somewhat ear-shaped, furnished without by a stout varix half the breadth of the aperture projecting more on the anterior end, on the right an inner lip stands as a rim within the varix, and spreads on the left upon the body whorl as a callus which above and below near each junction with the varix is emarginate, the lower emargination being opposite the columellar tubercle; five tubercles protect the entrance; on the outer lip are two blunt bosses whose apices are midway between the denticles of the left side; these latter consist of a rounded tubercle on the parietal wall half-way between the



C. H., del.

bifid tooth and the anterior angle of the aperture, of a compressed deeply entering keel, bifid externally, situated half-way down the aperture, and lastly, of a compressed deeply entering keel upon the columella, whose course can be traced from without by a wide furrow descending to the extremity of the umbilicus. Length 5½, breadth 3½ mm.

SCUTELLINA CINNAMOMEA, Gould.

This species was described by Gould in the Proc. Bost. Soc. Nat. Hist. Vol. ii. p. 151, in 1846, as a *Patella* (Exped. Shells, p. 9); it was again described by the same author in the U.S. Exploring Expedition, p. 345, and figured in the same work, fig. 449a, b.

Although the species has long been known to those who take an interest in Conchology in New South Wales and South Australia, it has always been considered a rare shell; but this year I have found it in considerable numbers rather below low-water mark, adhering to stones lifted from pools of undisturbed water all along the north side of the harbour, from Bradley's Head to Ball's Head, in the month of September.

In 1867 Mr. G. F. Angas published in the Proc. Zool. Soc. p. 185, a very valuable List of the Marine Mollusca found in Port Jackson and the adjacent Coasts; in fact, the issue of this paper was the starting point of Conchological study in New South Wales: for the time a masterly production. He listed in it three species of *Emarginula: rugosa* of Q. et G., *stellata* of A. Adams, and *dilecta* of A. Adams. No. 210 on Angas's list, *E. (Clypidina) stellata*, was the species which workers in conchology here were led to believe, till 1871, was the species under consideration and many specimens were distributed as such. But in 1871 Angas published a List of Additional Species of Marine Mollusca found in Port Jackson and the adjacent Coasts, in which *Scutellina cinnamomea* was included (p. 97), and it gave A. Adams' *Scutellina ferruginea* as a synonym.

This species is also recorded in Whitelegge's List of the Marine and Fresh-Water Invertebrate Fauna of Port Jackson and Neighbourhood, read before the Roy. Soc. of N. S. Wales, 3rd June, 1889, and published in their Journal and Proceedings as *Acmæa cinnamomea*, p. 272.

The specimens in the Australian Museum are still named incorrectly *Emarginula stellata;* to prevent future mistakes I think it worth while giving the correct name of the species in our Journal. The fact is that the species referred to as *stellata* is neither an *Emarginula* nor a *Scutellina;* it is a *Subemarginula*, and was described by A. Adams in 1851 in Proc. Zool. Soc. p. 87, as *Clypidina stellata;* the latter is figured in Sowerby's Thesaurus, p. 219, fig. 103.

Scutellina cinnamomea will be found fully described and well figured in Tryon and Pilsbry's Manual of Conchology, Vol. xii. p. 128, pl. XLVI. figs. 8, 9, 10, 11.

CHITON PICEUS, Reeve.

This species is recorded in Angas's List of the Marine Mollusca found in Port Jackson and on the adjacent Coasts, in P.Z.S. for 1867, p. 223, No. 241, as *Ch. piceus* of Gmel., with a reference to its description in Syst. Naturæ, p. 3204.

It is a very common species, as Angas remarks, "freely distributed on most parts of the coast, dwelling in cavities on exposed parts of the rocks," generally found about high-water mark,—at least this form is; I think, from a minute examination of the spines on the mantle and of the disarticulated valves, that this is *Acanthopleura spiniger* of Sowerby. Sowerby described this species in 1840 in Mag. Nat. Hist. p. 278, Suppl. pl. XVI. fig. 2. He figured it also in Conch. Illust. fig. 69, as *Ch. spiniger.*

A *Chiton* was described by Linnæus as *Chiton aculeatus* in Syst. Nat. x. p. 667, founded on Rumphius' Amboinische Rariteitkamer, pl. x. fig. 4, which was supposed to be this species, but the original description was so vague that Hanley suggested that the species should be dropped.

Chiton piceus of Reeve was not described till 1847 (in Conch. Icon. Monograph of *Chitons*, pl. XIII. fig. 70).

The species *piceus* is omitted in Whitelegge's List of the Invertebrate Fauna of Port Jackson, published in the Journal and Proceedings of the Royal Society of N. S. Wales for 1889, and *Chiton incana* of Gould represents the species there, No. 652, p. 273; but as the latter is a synonym of *Liolopleura Gaimardi* of Blainville, the name *incana* will not stand.

Under any circumstances the name *piceus* must be given up for our *Liolopleura*, and it must be given up also for our *Acanthopleura*, for a species of each of these genera exists in Port Jackson and on our adjacent coasts; one is *Liolopleura Gaimardi*, Blainville, the other is *Acanthopleura spiniger*, Sowb.

The former occupies exposed surfaces of rocks about high-water mark, and prefers fretted-out holes in the rock; the other I have only obtained by wading at very low tides, and then it is generally under rocks or in secluded places. The two species are extremely alike, but *A. spiniger* is the larger of the two; the two species can be readily distinguished by the characters of the girdle spines, *spiniger* having calcareous black or buff smooth spines, rather regularly curved, in alternate light and dark patches, about 2½ mm. long, the interior of the valves of a purple-brown colour; *Gaimardi* has the girdle densely clothed with intermingled minute, larger, and large calcareous spines, white and dark in alternate patches, some of them being striated.

For general details, see Tryon and Pilsbry's Man. of Conch. Vol. xiv. pp. 221 and 240.

CHITON GLAUCUS, Gray.

This name is given in Angas's List of the Species of Marine Mollusca found in Port Jackson and the adjacent Coasts, published in P.Z.S. for 1867, p. 185, No. 229. He gives as synonyms for the species, *Ch. Quoyi*, Desh., and *Ch. viridis*, Q. et G. He remarks that it is rare in Port Jackson, very variable in colour, and that the *green var.* is *Ch. Quoyi.*

The only other list of any importance of Port Jackson shells published is by Whitelegge, in the Journ. and Proc. of the Royal Soc. of N. S. Wales for 1889, where the same supposed species is recorded on p. 273 No. 633, as *Chiton glaucus*, and he makes it synonymous with *Ch. Quoyi*, Desh., and refers to Reevé's fig. 68 in his Mon. of *Chitons* in Vol. iv. pl. XIII.

It is also referred to in Hutton's Man. of the Moll. of New Zealand, p. 112, 1880, as occurring in New Zealand, which is its true home.

I wish to point out that the name *glaucus* will not hold good for this species; and in the second place, that I have very great doubts if this species has really ever been taken in Port Jackson.

Gray's *Ch. glaucus* was described in 1828 in Spicilegia Zoologica, part 1, p. 5; it was not figured and the habitat of his species was unknown. He states that it was *white inside, glaucous-green outside.*

Pilsbry remarks (Man. of Conch. by Tryon and Pilsbry, Vol. xiv. pp. 172, 173):—"Gray's *glaucus* had lost its girdle. No one has seen Gray's type, and its generic characters are wholly unknown. I have never seen a glaucous-green specimen of this species white inside; they are always blue. The identification of Quoy and Gaimard's well described and figured species with Gray's is highly hypothetical."

Gray's name *glaucus*, therefore, will have to be dropped.

The next name, *Ch. viridis*, which was given to the species by Deshayes, will also have to succumb, as the name was given by Spengler earlier to another species.

Quoy and Gaimard repeated the name of *viridis* in Voyage de l'Astrolabe, Zool. iii. p. 383, pl. LXXIV. figs. 23-28, in 1834.

The same *Chiton* was described by Deshayes in 1836 in Lamarck's Anim. sans Vertèbres, vi. p. 509, as *Quoyi*, and this name has been adopted by Pilsbry, the most recent monographer on the *Chitons*, in his Monograph on the Polyplacophora, Vol. xiv. p. 172, Man. of Conch. by Tryon and Pilsbry, 1892.

I have never myself taken a specimen of this species in Port Jackson, nor have I ever been able to obtain one taken from there, nor have I seen one. I find no such species taken from Port Jackson either in the Macleay Museum or the Australian Museum Collections. I do not say that it has not been found, but I cannot find a specimen which has come from there; further, Carpenter makes no allusion to this species existing in Angas's collection, which he examined critically, as from New South Wales.

Is it possible that the name *Plaxiphora glauca* of Q. et G., also described by Q. et G. in 1834 in the Voyage de l'Astrolabe, Zool. iii. p. 376, pl. LXXIV. figs. 7-11, has got mixed up with the smooth glaucous species from New Zealand? The true *P. glauca* was originally procured at D'Entrecasteaux Channel, Tasmania, a species, says Pilsbry, "evidently allied to *Plaxiphora petholata;* it is probably the form Angas collected at Guichen Bay in South Australia, and was listed by him *P. ciliata.*"

Angas remarks that it is the largest of the South Australian *Chitonidæ.*

CHITON PELLIS-SERPENTIS, Quoy et Gaimard.

This species, originally described in the Voyage de l'Astrolabe, Zool. iii. Moll. p. 381, pl. LXXIV. figs. 17-22, 1834, has hitherto not been recorded as being found in Port Jackson or the neighbouring parts of the N. S. Wales coasts. I have found it recently in considerable numbers in Port Jackson and at Port Hacking.

Its home seems to be New Zealand, where it is said to be one of the most abundant of the *Chitons* found on those shores. It is not in Angas's List of the Marine Mollusca found in Port Jackson, published in 1867 in Proc. Zool. Soc. p. 185, nor is it recorded in Whitelegge's List of the Marine and Fresh-Water Invertebrata of Port Jackson and Neighbourhood, published in the Journal and Proceedings of the Royal Society of N. S. Wales for 1889.

It is well figured by Reeve in the Conch. Icon. Monograph of *Chitons*, pl. XV. fig. 84, and in Tryon and Pilsbry's Manual of Conchology, Vol. xiv. p. 173, pl. XXXVII. figs. 14-18. It is closely allied to *C. Sinclairi*, Gray, another New Zealand species.

CHITON INCEI, Reeve.

Described in Conch. Icon. Monograph *Chitons*, Sp. 94, pl. XVI. fig. 96, detail, fig. 94, 1847, and listed in Angas's Marine Moll.

of Port Jackson and adjacent Coasts in P.Z.S. 1867, p. 185, No. 239, on p. 223, and also in Whitelege's List of Marine and Fresh-Water Invertebrate Fauna of Port Jackson and Neighbourhood, published in 1889 in Journ. and Proc. Royal Soc. N. S. Wales; it will have in future to be known as *Onithochiton Lyellii*, Sowerby, having been described by him in 1832 in P.Z.S. p. 26, and figured by him in Conch. Illust., fig. 7.

It was described by Reeve a second time in Conch. Icon. as *Ch. puncticulatus,* Sp. 69, pl. XII. fig. 69b. See Tryon and Pilsbry's Manual of Conchology, Vol. xiv. p. 247, pl. LV. figs. 1-7.

ISCHNOCHITON HADDONI, Pilsbry.

One of our commonest *Chitons,* it has hitherto been regarded and catalogued as *Ischnochiton longicymba* of Q. et G. It will be recognised as the *Chiton* in this harbour having a rather more or less wide white dorsal stripe; other specimens of it are of a light buff all over; others are brown, or speckled with olive-black, and some show a decided red tinge.

We are indebted to Mr. H. A. Pilsbry for showing that we have been labouring under a misapprehension as to this species which he has defined with much care and minuteness in the Manual of Conchology by Tryon and Pilsbry, Vol. xiv. p. 88, pl. XXII. figs. 67-73.

The true *I. longicymba* is a New Zealand species and is claimed to be found in South Australia, Tasmania, and Victoria, but so far, I think, no published account has been made of the results of a critical examination of the supposed species otherwise than from New Zealand.

The "scales of the girdle of *Haddoni* are beautifully regular in size and arrangement and are evenly and deeply grooved; whereas in *longicymba* the girdle is closely covered with solid convex but somewhat flattened imbricating scales, most of which are rather weakly striated, but among which non-striated scales are mingled" (Pilsbry).

DISTRIBUTION OF LITTLE-KNOWN MOLLUSCA FROM POLYNESIA AND AUSTRALIA, WITH THEIR SYNONYMS.

By John Brazier, F.L.S., C.M.Z.S.

1. Eulima Hargravesi, Brazier.

Eulima porcellana, H. Adams *(non* A. Adams), Proc. Zool. Soc. London, 1872, p. 15, pl. iii. fig. 29.

Hab.—New Hebrides *(W. H. Hargraves)*; Whale Island, Aneiteum, New Hebrides, in beach débris *(J. Brazier*, August, 1865).

Mr. A. Adams in Proc. Zool. Soc. London, p. 276, No. 3, 1851, described a *Eulima* under the specific name of *porcellana*, and figured it in his Monograph of the genus in Sowerby's Thesaurus Conchyliorum, Vol. iii. p. 797, pl. clxviii. fig. 25. Mr. G. W. Tryon in his Manual of Conchology, Vol. vii., on *Eulimidæ*, 1886, appears to have overlooked the species described by H. Adams; the species is quite distinct as regards size and sculpture; name changed as above.

2. Chlorostoma (Omphalius) Pfefferi, Dohrn.

Omphalius Pfefferi, Dohrn, Malakozoologische Blätter, p. 56, No. 2, 1864.

Chlorostoma Pfeifferi, Pilsbry *(non* Philippi), Tryon's Manual of Conchology, Vol. xi. 1889, p. 189, pl. lxi. figs. 28, 29.

Chlorostoma Dohrni, Pilsbry, l.c. p. 469.

Hab.—New Hebrides *(H. Dohrn)*; Anelecauhat Harbour, Aneiteum, New Hebrides, found on rocks and under stones at low water *(Brazier*, 1865); Aneiteum *(Captain Braithwaite)*.

I do not see that there is any occasion for Mr. Pilsbry to change the specific name to *Dohrni*, when Dohrn spells the name *Pfefferi* and Pilsbry *Pfeifferi*. Dr. Philippi described a *Trochus Pfeifferi* from Japan. With the above species I also found *Monodonta*

(Diloma) constellata, Souverbie, but of a much darker colour than the types from New Caledonia.

3. PLECOTREMA CONCINNA, H. and A. Adams.

Plecotrema concinna, H. and A. Adams, Proc. Zool. Soc. London, p. 122, No. 9, 1853; Genera of Recent Mollusca, Vol. ii. p. 241; Pfeiffer in Malakozoologische Blätter, p. 150, No. 97, 1854; Monographia Auriculacearum Viventium, p. 101, No. 2, 1856; Catalogue of Auriculidæ in the British Museum, p. 76, No. 2, 1857; Paetel, Catalog der Conchylien Sammlung, p. 114, 1873; Pfeiffer, Monographia Pneumonopomorum and Auriculaceorum, p. 343, No. 2, 1876.

Hab.—— ? *(Mus. Cuming*, 1853); Australia *(Pfeiffer*, 1854); Moreton Bay, Australia *(Pfeiffer and British Museum*, 1856-57); Moreton Island, near the Pilot Station, and Stradbroke Island, Moreton Bay, Queensland, March and December, 1862; Tambourine Bay, Lane Cove River, May 24, 1865; Double Bay, east side, Feb. 8, 1879; Bantry and Hunter's Bays, Middle Harbour, Port Jackson, June 20, Sept. 26, 1886 *(Brazier)*.

Specimens of this species collected by me in Queensland in 1862 were sent to Mr. Henry Adams in 1869 and duly named *Plecotrema concinna*, H. and A. Ad. The four specimens collected at Tambourine Bay, Lane Cove River, in May, 1865, were sent to Mr. Angas in 1866; it appears he lost them and never recorded the species in his Lists of the Marine Mollusca of Port Jackson.

In 1879 with Mrs. Brazier I collected 34 specimens at Double Bay, below the residence of the late Hon. S. D. Gordon; six were sent to the British Museum and compared with the types and named by Mr. E. A. Smith *Plecotrema concinna*, H. and A. Ad.

There is another species of *Plecotrema* named *bicolor*, Pfr., said to have been found in Port Jackson by the late Mr. F. Strange on the authority of Cuming.

4. LAIMODONTA CONICA, Pease.

Laimodonta conica, Pease, Proc. Zool. Soc. p. 242, 1862, American Journal of Conchology, Vol. iv. p. 101, pl. XII. fig. 15, 1868.

Laemodonta conica, E. v. Martens and Langkavel, Donum Bismarckianum, Eine Sammlung von Südsee-Conchylien, p. 57, pl. III. fig. 13, 1871.

Laimodonta conica, Schmeltz in Museum Godeffroy, Catalog V. p. 87, 1874.

Melampus conicus (Laimodonta), Pfeiffer in Monographia Pneumonopomorum and Auriculaceorum, p. 319, No. 85, 1876.

Hab.—Central Pacific and Paumotus Islands *(W. H. Pease)*; Vavau, Friendly Islands, found in shaded places in the crevices of coral above high water, specimens large, July 14, 1865; Great Sirius Cove or Mossman's Bay, Port Jackson, found in clusters of rock-oysters, *Ostrea cucullata*, Born, December 24, 1865; No. VI. or Eclipse Island, Claremont Group, 9 miles east of Cape Sidmouth, North Queensland, December, 1871 *(Brazier)*.

Specimens of this species from the above localities were submitted to Mr. W. H. Pease in October, 1871, and duly named *Laimodonta conica*, Ps.; and since that date others were sent to the British Museum in 1879 and named from actual specimens, and not from figures or descriptions. Since December, 1865, I have never found the species in any part of Port Jackson. At one time *Strombus luhuanus*, Linné, was found on a sandy mud-flat in vast numbers at low water at the Bottle and Glass rocks, Vaucluse Bay, Port Jackson; the species appears to have disappeared from the Port since May, 1865; dead specimens have been found on the north coast near the Richmond River.

5. NERITINA (NERITILLA) RUBIDA, Pease.

Neritina rubida, Pease, American Journal of Conchology, Vol. iii. p. 285, pl. XXIV. fig. 5, 1867; E. v. Martens and Langkavel, Donum Bismarckianum, Eine Sammlung von Südsee-Conchylien, p. 46, pl. II. fig. 13, 1871.

Neritina (Neritilla) rubida, Tryon, Manual of Conchology, Vol. x. p. 54, pl. XVII. fig. 84, pl. XVIII, fig. 85, 1888.

Neritina apea, Garrett, MS.

Hab.—Tahiti *(Garrett and Pease)*; Upolu *(Gräffe)*; Pango-Pango or Pago-Pago, Funga-loa Harbour, Tutuila, Samoa or

Navigators' Islands, found in the crevices of basalt stones above high-water mark enclosing a field of taro, *Caladium esculentum (J. Brazier*, July 1, 1865).

6. CLEMENTIA STRANGEI, Deshayes.

Clementia Strangei, Deshayes, Proc. Zool. Soc. London, p. 17, No. 1, 1853.

Clementia Strangei = *papyracea*, Gray; E. A. Smith, Voyage of H.M.S. Challenger, Zoology, Vol. xiii. p. 154, 1885.

Hab.—Moreton Bay, Queensland *(F. Strange)*; Port Darwin, Northern Territory *(W. T. Bednall)*; Mud Bay, Cape York, North Queensland, found thrown up on the beach *(Brazier, Chevert Expedition)*; Torres Straits, in 3 to 11 fathoms *(H.M.S. Challenger)*; off Cockatoo Island, Port Jackson, New South Wales, 3 to 4 fathoms, mud bottom, with *Myochama Strangei*, A. Adams, on *Circe scripta*, Linné *(Brazier*, 1864).

Clementia Strangei is transversely and regularly plicated with somewhat strong ridges. *Clementia Moretoniensis*, Desh., = *Clementia papyracea*, Gray, has the surface of the valves widely concentrically striated and faintly plicated; the latter species is also found off Cockatoo Island, Mossman's Bay, Lane Cove River, and Middle Harbour, Port Jackson, living in mud.

7. MYLITTA TASMANICA, Tenison-Woods.

Pythina tasmanica, Tenison-Woods, Proc. Royal Soc. Tasmania, p. 162, 1875; Tate, Trans. Roy. Soc. South Australia, Vol. ix. p. 98, pl. v. fig. 12, 1887.

Mylitta Deshayesii, E. A. Smith, Annals and Mag. Nat. Hist. p. 229, 1891.

Mylitta tasmanica, Tate, Trans. Roy. Soc. South Australia, Vol. xv. p. 135, 1892.

Hab.—King Island, Bass Straits *(Tenison-Woods)*; Fowler and Streaky Bays, St. Vincent Gulf, South Australia *(Professor Tate)*; Ball's Head, Port Jackson, New South Wales, 18 fathoms, found in sandy mud, broken shells, May, 1864 *(J. Brazier)*; Green Point, Watson's Bay, found in shell sand inside an old bottle, 1893 *(Mr. A. U. Henn)*.

This species I have compared with actual specimens from Tasmania, and not descriptions and figures only, and they agree in every detail with the Port Jackson shells. The other species, *Mylitta Deshayesii*, D'Orb. and Recluz, has been found in South Australia and Tasmania, and I have received it from Cape Riche, King George's Sound; found in shell sand.

8. MODIOLA ARBORESCENS, Chemnitz.

Mytilus arborescens, Chemnitz, Conch. Cab. Vol. xi. p. 251, pl. 198, figs. 2016, 2017, 1795.

Modiola picta, Lamarck, Anim. sans Vert. Vol. vi. part 1, p. 112, No. 8, 1819; Encyclopédie, pl. CCXXI. fig. 2.

Mytilus arborescens, Dillwyn, Catalogue of Recent Shells, Vol. i. p. 306, No. 14, 1817.

Modiola picta, Deshayes; Lamarck, Anim. sans Vert. Vol. vii. p. 21, No. 8, 1836.

Mytilus pictus, Deshayes, Encycl. Méth. Vers. Vol. ii. p. 569, No. 34.

Modiola picta, Sowerby, Genera of Recent and Fossil Shells, Vol. ii. pl. XCIX. fig. 1.

Modiola arborescens, Hanley, Catalogue of Recent Bivalve Shells, p. 237, 1843.

Modiola arborescens, Jay, Catalogue of Shells, 4th edition, p. 76, No. 2149, 1850.

Modiola arborescens, Hanley; Wood, Index Testaceologicus, 2nd edition, No. 5, p. 67, species 13, pl. XII. fig. 13, 1855.

Modiola arborescens, Reeve, Conch. Icon. Vol. x. pl. VI. fig. 30, 1857.

Perna arborescens, H. and A. Adams, Genera of Recent Mollusca, Vol. ii. part 32, p. 516, 1857.

Modiola arborescens, Tenison-Woods, Census of the Marine Shells of Tasmania, Proc. Royal Soc. Tasmania, p. 55, 1877.

Modiola arborescens, Clessin, Conch. Cab. 2nd edition, Kuster, part 8, p. 100, pl. XXIX. fig. 10, 1887.

Modiola arborescens, Tate, Trans. Royal Soc. South Australia, Vol. xiv. p. 268, 1890-91.

Hab.—Coast of St. Domingo *(Chemnitz)*; China *(Humphreys)*; Atlantic Ocean (?) *(Lamarck)*; Long Bay, Tasmania *(Rev. H. D. Atkinson)*; between Ball's Head and Goat Island, Port Jackson, N.S.W., 18 fathoms, found in company with *Modiola glaberrima*, Dunker; off Sydney Heads, 45 fathoms *(J. Brazier*, May, 1864, June, 1874); one valve dredged off Troubridge by Mr. E. H. Mathews; several living specimens and detached valves dredged at 14 to 17 fathoms in Yankalilla Bay, South Australia, by Dr. Verco *(Professor R. Tate)*.

Previous writers have recorded this very handsome species as coming from the West Indies and the Atlantic and China. The late Rev. J. E. Tenison-Woods was the first to record it from Tasmania. I have specimens dredged by the Rev. H. D. Atkinson that measure 2 inches in length; our Port Jackson examples from Ball's Head are a little longer; younger specimens have been dredged in various parts of the harbour and off Sydney Heads, 45 fathoms; the species is very rare.

Deshayes was the first to misquote Chemnitz's work in Lamarck; he there states that *Mytilus arborescens*, Chem., is figured in Vol. ii. of the Conchylien-Cabinet. Hanley does the same in his Catalogue of Recent Bivalves, 1843; Jay also in his Catalogue, 1850; Reeve the same in the Conch. Icon., 1857; Tenison-Woods in his Census of the Tasmanian Marine Shells-1877; Professor Tate in Proc. Royal Soc. South Australia, 1890, 91. Hanley in Woods' Index Test., quotes the correct Volume xi. of the Conch. Cab., and gives Chemnitz's locality, St. Domingo; the species might have its home in the West Indies as well as in Australia. My friend Mr. E. A. Smith records *Lima multicostata*, Sowerby, in the Report of the Lamellibranchiata, Zoology of H.M.S. Challenger, Vol. xiii. p. 288, as having been dredged off Bermuda in 1075 fathoms. This is a species common to Port Jackson and the east coast of Australia and off Tongataboo in 18 fathoms.

NOTES AND EXHIBITS.

Dr. Cox exhibited a fine specimen of the herring *Elops saurus*, Linn., purchased in a Sydney fishmonger's shop, and believed to have been captured off Broken Bay; the species is occasionally taken in Port Jackson, though it is more properly an inhabitant of tropical seas. He also showed a piece of timber in an excellent state of preservation supposed to be red gum, a portion of a tree encountered in sinking a shaft in the bed of the river during the building of the bridge at Echuca; the specimen was forwarded to him by Mr. A. P. Stewart of Hay, N.S.W. Dr. Cox also showed specimens of the shells referred to in his paper, and a very fine example of *Voluta mamilla* from Tasmania.

Mr. Froggatt exhibited a fine series of mounted galls and coccids in illustration of his paper, including a new Brachyscelid collected by Mr. A. Roxburgh at Cobar, and representatives of several new species of *Opisthoscelis.*

Mr. North exhibited a set of eggs consisting of three eggs of *Collyriocincla harmonica* and an egg of *Cacomantis pallida* collected on the Woolli Creek on the 19th inst. The cuckoo's egg was deposited on the 17th inst., when the nest contained but two eggs of the *Collyriocincla.* This is the only occasion he had known the egg of any cuckoo to be found in the nest of the Harmonious Thrush. Mr. North also communicated the following Note:—"Several nests of *Maluri* and *Acanthizæ* found during this month contained one and in some instances two of one or the other Bronze Cuckoos, *Lamprococcyx plagosus* and *L. basalis*, at present so common in the neighbourhood of Sydney, and it is worthy of remark that frequently when an egg of a cuckoo is deposited in the nest of *Malurus cyaneus* before the owner has commenced to lay, the occupants of the nest cover over the egg of the parasitical intruder with a thick layer of nest material. Formerly I attributed the finding of the cuckoo's egg imbedded in this way in the bottom of the nest to the bird having deposited it before the nest of the *Malurus* was finished, but on referring to my notes I find that it is only at the bottom and in the lining of the nests of this species the cuckoo's eggs were inclosed. In a similar position in the remains of a nest of *Malurus cyaneus* Dr. Hurst has also recorded before this Society finding the egg of *Cacomantis insperatus*. I now believe it to be a protective habit developing in this species against hatching the egg and rearing the intruder as advanced by Messrs. Sclater and Hudson in a parallel instance in their work on "Argentine Ornithology," where *Sisopygis icterophrys*, a common tyrant-bird in Buenos Ayres, frequently has recourse to the same expedient when the Argentine Cow-bird, *Molothrus bonariensis*, deposits its eggs in the nest of the tyrant-bird before the owner has begun to lay."

Mr. Mitchell, of Narellan, contributed the following Note on the Occurrence of certain Fossils from unrecorded Localities:—

"*Lepidodendron:* Among some specimens sent to me by my friend Mr. Engelhardt is a small fragment that appears to me either to be a portion of a *Lepidostrobus* or of the stem of *Halonia.* The scars in character resemble *L. goldenbergii*, but in size approach those of *H. tortuosa.*

Loc.—Stockyard Mountain (Engelhardt).

"Associated with the Glenlee fossils previously recorded are scales which bear a very strong resemblance to those of *Lepidostrobus* and *Sigillariostrobus.* In form and structure they are nearer to those of *L. ornatus*, Lindl. et Hut., than any others I have been able to compare them with. Some, however, are not unlike *Lepidophloios lepidophyllifolius*, Gold. Again, in their expanded bases, central rib, and tapering apices they have affinities with *Sigillariostrobus.* The determination as scales of either of the above-mentioned genera would be of very great interest, and I record the occurrence of these scales and refer them hesitatingly, though with good reason, to one or other of the genera mentioned, to draw the attention of other interested workers to them.

"Mr. Etheridge, Palæontologist to the Australian Museum and Department of Mines, N.S.W., to whom I submitted them, agrees that they strongly resemble *Lepidostrobus* scales.

"*Pterophyllum:* A specimen of this genus was collected by me from the quarry at Kenny Hill, near Campbelltown."

Mr. A. M. Lea showed a small collection of insects which inhabit ant and termite nests, including a dipterous insect *(Microdon variegata)*, one of the Micro-lepidoptera at present undetermined, both from Sydney; and of coleoptera, two species of *Pselaphidæ* from Tamworth and Inverell, *Anthrenus* sp., from Sydney, *Lagria* n.sp., from Cootamundra and Queanbeyan, and a fifth species (g. et sp. indet.).

Mr. Brazier exhibited for Mr. T. Steel three aboriginal stone axes, one with a groove for hafting, from the Herbert River, said to have been found at a depth of 30 feet in sinking a well; a second from the Tweed River, being a simple adaptation of a flat water-worn stone by grinding the thinner end; the third from Harrow, Victoria.

Mr. Fletcher exhibited for Mr. G. L. Pilcher of Rockhampton an undescribed longicorn, and two of the mud nests of one of the solitary wasps *(Eumenes Latreillei*, Sauss.), together with specimens of the wasp and of a species of *Chrysis* which, like members of the same family elsewhere, plays the part of cuckoo; and he communicated a note giving particulars of the mode of construction of the nests exhibited, and of the habits of the maker and of the attendant intruder.

WEDNESDAY, NOVEMBER 29TH, 1893.

The President, Professor David, B.A., F.G.S., in the Chair.

Mr. C. Haviland, Sydney, and Mr. R. H. Pulleine, The University, Adelaide, were elected Members of the Society.

The President announced that the Council had elected Professor T. Jeffery Parker, D.Sc., F.R.S., of Dunedin, and Professor W. Baldwin Spencer, M.A., of Melbourne, Corresponding Members of the Society.

Also that the next Ordinary Monthly Meeting—being the first of the Session for 1894,—together with the Annual General Meeting, would be held on Wednesday, March 28th, 1894.

DONATIONS.

"United States National Museum—Proceedings." Vol. xiv. (1891). *From the Museum.*

"Missouri Botanical Garden—Fourth Annual Report" (1893). *From the Trustees.*

"American Museum of Natural History—Twenty-fourth Annual Report" (1892): "Bulletin." Vol. v. Sheets 13-15, pp. 193-240. *From the Museum.*

"Cincinnati Society of Natural History—Journal." Vol. xiv. No. 1 (1893). *From the Society.*

"American Academy of Arts and Sciences — Proceedings." Vol. xxvii. (1893). *From the Academy.*

"Academy of Natural Sciences of Philadelphia—Proceedings, 1893." Part 1. *From the Academy.*

"American Philosophical Society—Proceedings." Vol. xxxi. No. 140 (1893). *From the Society.*

"New York Academy of Sciences—Annals." Vol. vii. Nos. 1-5 (1893). *From the Academy.*

"British Museum (Natural History)—Catalogue of Snakes." Vol. i. (1893): "Catalogue of Birds." Vol. xxi. (1893): "Catalogue of Madreporarian Corals." Vol. i. (1893). *From the Trustees.*

"Royal Society of Canada—Proceedings and Transactions." Vol. x. (1892). *From the Society.*

"Geological Survey of India—Records." Vol. xxvi. Part 3 (1893). *From the Director.*

"Asiatic Society of Bengal—Journal." Title-page and Index for 1892; Vol. lxii. Part i. No. 2 (1893); Vol. lxii. Part ii. No. 2 (1893): "Proceedings, 1893." No. vii. *From the Society.*

"Entomological Society of London — Transactions, 1893." Part 3. *From the Society.*

"Royal Society of London—Proceedings." Vol. liii. No. 325; Vol. liv. No. 326. *From the Society.*

"Pharmaceutical Journal of Australasia." Vol. vi. (1893), No. 10. *From the Editor.*

"Perak Government Gazette." Vol. vi. (1893), Nos. 24-25. *From the Government Secretary.*

"Zoologischer Anzeiger." xvi. Jahrg. Nos. 429-431 (September-October, 1893). *From the Editor.*

"Société d'Horticulture du Doubs, Besançon — Bulletin." Nouvelle Série, No. 33 (September, 1893). *From the Society.*

"Société Royale Linnéenne de Bruxelles—Bulletin." xviii^{me} Année, Nos. 8-9 (September, 1893); xix^{me} Année, No. 1 (October, 1893). *From the Society.*

"K. K. Zoologisch-botanische Gesellschaft in Wien—Verhandlungen." xlii. Band, 3 u. 4 Quartal (1892-93). *From the Society.*

"Zoologische Station zu Neapel—Mittheilungen." ii. Band, 1 u. 2 Heft (1893). *From the Director*

Pamphlet entitled—"Hepaticæ Madagascarienses." By W. H. Pearson (1893). *From the Author.*

"Naturwissenschaftlicher Verein des Reg.-Bez., Frankfurt a/O.—Societatum Litteræ." vii. Jahrg. Nos. 4-7 (April-July, 1893): "Helios." xi. Jahrg. Nos. 2-5 (May-August, 1893). *From the Society.*

"Société Entomologique de Russie—Horæ." Tome xxvii. (1893). *From the Society.*

"Victorian Naturalist." Vol. x. No. 7 (November, 1893). *From the Field Naturalists' Club of Victoria.*

"Hooker's Icones Plantarum." (Fourth Series) Vol. ii. Part 3 (1893). *From the Director, Royal Gardens, Kew.*

"Gesellschaft für Erdkunde zu Berlin—Verhandlungen." Bd. xx. (1893), No. 7. *From the Society.*

"Museum of Comparative Zoology at Harvard College—Bulletin." Vol. xvi. No. 14 (August, 1893); Vol. xxv., No. 1 (September, 1893). *From the Director.*

"United States Department of Agriculture—Division of Ornithology and Mammalogy—Bulletin." No. 4 (1893). *From the Secretary of Agriculture.*

"Senckenbergische naturforschende Gesellschaft in Frankfurt a/M.—Bericht, 1893": "Katalog der Reptilien-Sammlung im Museum" (1893). *From the Society.*

"Radcliffe Library, Oxford University Museum—Catalogue of Books added during 1892." *From the Trustees.*

Pamphlet entitled—"Further Notes on Australian Hydroids, with Descriptions of new Species." By W. M. Bale, F.R.M.S. (1893). *From the Author.*

"American Naturalist." Vol. xxvii. (1893), No. 321. *From the Editors.*

"College of Science, Imperial University, Japan—Journal." Vol. vi. Part 3 (1893). *From the University.*

"Académie Royale des Sciences, Amsterdam—Verslagen en Mededeelingen." Afdeeling Natuurkunde. Derde Reeks. ix. Deel: "Register." Dl. i.-ix. (1893): "Jaarboek, 1888 and 1892": "Zittingenverslagen, 1892-93": "Verhandlingen." (Tweedie Sectie) Dl. i. (Nos. 1-10); Dl. ii. No. 1 (1893). *From the Academy.*

"Société des Sciences de Finlande—Observations Météorologiques en 1884, 1885, 1886, 1890, and 1891." *From the Society.*

"Department of Mines, Victoria—Special Reports: Reports on Victorian Gold-Fields." No. 2. By James Stirling, F.G.S. (1893). *From the Hon. the Minister for Mines.*

Medallion Portrait of the late Rev. R. Collie, F.L.S., a Member and Benefactor of the Society. *From D. H. Batchen, Esq.*

PAPERS READ.

A THYLACINE OF THE EARLIER NOTOTHERIAN PERIOD IN QUEENSLAND.

By C. W. De Vis, M.A., Corr. Mem.

We have it on the authority of the late Sir R. Owen, confirmed by Mr. Lydekker, that the smaller of the examples of Thylacine jaws from the Wellington Caves which have reached the hands of those authors "cannot be distinguished from large male individuals of *Thylacinus cynocephalus*," the existing species.* To that species they are referred by Owen, while Lydekker regards them provisionally as belonging to the weaker sex of Owen's *T. spelæus*. Of *T. spelæus* itself all we know is derived from the improved figure of the type specimen given by Owen on Plate v. fig. 9, of his 'Extinct Mammals of Australia,' and from his account of that and other examples of the species in the text of the same work (p. 106), where he says—"In *Thylacinus major* (= *spelæus*) the upper canine is proportionately longer in comparison with the lower than it is in *Thylacinus cynocephalus*: the other osseous and dental characters, so far as they are at present represented by fossils, indicate chiefly a superiority of size as compared with the still existing Tasmanian species." We are then at liberty to assume that apart from relative size there are no salient differences between these two species other than a larger upper canine in the Cave Thylacine, and are consequently free to record the occurrence of a *Thylacinus* also larger than the living species but differing from it in so many expressive features as almost to exclude the possibility of its identification with a species so closely resembling the latter as *T. spelæus*. Remains of a Thylacine have for some years been present in the Queensland Collection, where they have been left unlabelled because they excited a strong suspicion that they differed too much from the living species to belong to *T. spelæus;* that suspicion is now an assurance. Sufficient proof of the fact has within the last few days been furnished by the discovery of the major part of the left side of a skull containing the whole of the teeth except the second upper premolar, and accompanied by the first four cervical vertebræ, the condition of the teeth showing that they were derived from an aged individual. For these interesting fossils, which were brought to light at Ellangowan, near Cambooya, on the Darling Downs, the Collection is indebted to the quick perception of their novelty and value shown by their exhumer, Mr. A. B. Briggs, of that ilk.

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* Catalogue of Fossil Mammals in the British Museum, Pt. v. p. 264.

Cranium: Comparing the cranium with that of a male of the "Tasmanian Tiger" so called, the more striking of the differences existing between them may be set down as follows:—The total length of the skull is 239 mm., against 231 mm. in *T. cynocephalus*, that is, it is $\frac{1}{29}$ greater; the total length of the dental series is 130 mm., against 120 mm., or $\frac{1}{12}$ greater; but the total length of the premolars and molars together is only 92 mm., against 88 mm., or $\frac{1}{22}$ greater, indicating a distinctly longer muzzle; the second and third incisors are separated by interspaces from the first and fourth, which last has no rudimentary lateral lobes marked off by shallow vertical impressions on its anterior surface; the canine is more compressed, especially on the posterior side of the basal half of the crown, where it presents an edge which, in consequence of a sudden attenuation of the distal half of the tooth, slopes downwards and forwards much more rapidly than does the rounded surface of the recent tooth; the space between the first and third premolars is relatively much longer, being 25 mm., against 18·5 mm., or more than $\frac{1}{3}$ greater; the posterior cusp of p^3 is less distinct and is in contact with m^1; m^1 is longer in proportion to m^2m^3, the ratios being, in the fossil, 12 : 28, in the recent teeth, 11 : 29; m^3 is broader in proportion to its length and shorter in proportion to the size of the cranium, the ratios of breadth to length being, in the fossil, 12·5 : 15, in the recent tooth, 12 : 15, and the posterior side of its inner cusp is joined to the blade by a compressed ridge; m^4 is the most remarkable of the true molars and might easily be mistaken for the last molar of a large *Sarcophilus* : is is similar in shape, with diameters as 9 : 5, entirely without inner or posterior cusps, and shorter than the remainder of the tooth in the living species ; the premaxillary, measured at the anterior edge of the alveolus of the canine, is 4 mm. or $\frac{2}{7}$ broader than in *T. cynocephalus ;* the length of the premaxillary from the anterior end of the nasal is 44·5 mm., against 40·5 mm. In the posterior region of the skull the occipital condyle is relatively large, 25 mm., against 20·5 mm. in length, or nearly $\frac{1}{4}$ longer ; the paroccipital process is strong and directed downwards and backwards at an open angle, instead of being nearly perpendicular; the supraoccipital and exoccipital crests are continuous, with but a slight emargination over their junction ; the zygomatic process of the squamosal has its posterior surface inclining backwards instead of forwards, and consequently closing up to a great extent the space between it and the exoccipital crest.

Mandible : The total length of the mandible is 193·5 mm. against 191·5 mm., the two species thus approaching much more nearly to equality in this measurement than in the length of the cranium; its depth below the first premolar is 24 mm. against 18 mm., the animal had therefore a much deeper chin ; the total length of the dental series is 118·5 mm. against 116·5 ; the total length of the premolar and molar series is 99 mm., or practically the same as in the recent jaw, in which it measures 98·5 mm. ; the length of the last molar is 17·3 mm. against 16·6 mm. ; from the hinder surface of the last molar to the origin of the revolute inferior edge of the outer crotophyte fossa the length is 43·3 mm. against 51 mm. ; the least width of the hinder surface of the condylar process is 11 mm. against 14·5 mm. ; the anterior orifice of the dental canal is almost wholly in advance of the second premolar instead of beneath the posterior half of that tooth ; the coronoid process rises at a higher angle; the third incisor is separated by an interspace from the canine ; this latter is scarcely smaller than the canine of the upper jaw and is less curved than in the recent species ; the first and second premolars are separated by a longer interspace.

In the atlas the vascular foramen beneath the root of the diapophysis is reduced to a minute orifice, but apart from greater size this vertebra presents no noteworthy difference from that of *T. cynocephalus.*

The axis has its postzygopophysial facette directed outwards to an obviously less extent, and its neural arch is longer in proportion to the length of the centrum, which has a length of 56 mm. against 54 mm. and a breadth exactly proportionate to that of the living species.

The total length of the skull and vertebræ present compared with those of the existing species is as 357 to 330, or about $\frac{1}{12}$ greater, as in the upper series of teeth. Taking this fraction as a constant, the bulk of the individual represented by the remains under view may be estimated at about a fourth greater than that of the modern species. From measurements given above it may be further inferred that it had a relatively short head, terminating anteriorly in a longer and considerably deeper snout.

Its variance from the Tasmanian Thylacine is writ large on most of its features, and consequently it can have little of specific moment in common with *T. spelæus.* If perchance it should eventually appear that the differences now pointed out are in reality exhibited by examples of *T. spelæus,* still, as they have not been published so far, that species has not been so described as to be recognisable, and its name should lapse in favour of the one now proposed, *Thylacinus rostralis.*

The cranial remains previously collected and now claiming to belong to the present species are these:—A portion of an aged right maxilla (Cat. No. 12,027) with p^2 in place and the sockets of p^3 and m^1. The length of the tooth and sockets combined is 47·5 mm. against 38 mm. in *T. cynocephalus.* This maxilla shows that the type does not exemplify the full size attained by the species, since in it the corresponding length is but 44 mm. The palatal surface is transversely concave (Pilton). The dentary process of a left maxilla (Cat. No. 12,028) with all the molars and part of the last premolar. The length of the molar series is 53 mm., in the type 59 mm., in the recent species 59·5 mm.

exclusive of the posterior cusp of m^4 ; in this example m^4 has a very small inner cusp ; the length of m^3 is 12·7, its breadth 10·5. This specimen appears to have been derived from a small and aged female (Gowrie Creek). A fragment (Cat. No. 12,031) of a left maxilla with the third premolar (Chinchilla). Anterior portion of a right mandibular ramus (Cat. No. 12,029) with m^1 and fangs of the premolars and canine. The length of the premolar series is 57·5 mm., in the type 56·5 mm., in the living species 54·5 mm. ; depth of mandible below the first premolar 28 mm. Anterior orifice of dental canal beneath anterior half of p^2. Length of symphysis 53 mm. against 57·5 in the type specimen and 52·5 in *T. cynocephalus* (Chinchilla). A portion of a left mandibular ramus with p^1, p^2, and part of p^3 (Cat. No. 12,030). Length of p^1p^2 21·5 mm., as in the recent species, the interspace being less than in the type, in which the two teeth occupy a space of 30·5 mm. Dental orifice beneath the middle of p^2 (Gowrie Creek).

A SECOND NOTE ON THE *CARENIDES*, WITH DESCRIPTIONS OF NEW SPECIES.

By Thomas G. Sloane.

Having ten new species to add to the *Carenides*, it has seemed to me a fitting opportunity to review the classification of the group, as far as the material at present in my hands will allow of my so doing.

Five years ago I drew up a synoptic table of the different genera into which the *Carenides* had then been divided.* This table as I recognised at the time was far from being satisfactory, therefore in the present paper another tabular list of the principal genera of the group is attempted, which, though evidently defective in many points, seems founded on more natural characters and freer from artificiality than the former. The genera *Epilectus*, *Trichocarenum* and *Eutoma* have not been included in the table; the two former because no example of either has yet come under my notice; the last because, as yet, I have been unable to find any satisfactory characters to separate it readily from the *quadripunctatum* group of the genus *Carenum*, although it seems too useful and well known a division of the *Carenides* to be merged with *Carenum*. Sir William Macleay's genera *Carenoscaphus*, *Calliscapterus*, and *Platythorax*, with the sub-genera *Chariscapterus* and *Paliscaphus* formerly suggested by me, are now again united with the central genus *Carenum*.

It seems only necessary to add that the digitation of the external side of the anterior tibiæ does not seem to me of sufficient classificatory value in the *Carenides* to warrant its being used as a character on which to found genera.

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* P.L.S.N.S.W., 1888, III. (2) p. 1104.

Table of the principal Genera of the tribe Carenides.

I. Palpi filiform. Anterior tibiæ with outer apical angle projecting strongly forward, and with two strong external teeth *(tridentate)*, the tooth next the apical projection as near as, or nearer to the apex than where the inner apical spine rises.................................. *Scaraphites.*

II. Palpi with last joint triangular or securiform. Anterior tibiæ with outer apical angle projecting strongly forward, the external edge either dentate or not; if dentate, the tooth next the apical projection placed further from the apex than where the inner apical spine rises.

A. Anterior tibiæ with external edge dentate.

a. Lateral border of elytra either strongly reflexed or thickened to form an upturned projection at each shoulder.

b. Lower edge of orbit prominent or projecting forward in front below eye. (Form broad and heavy; colour entirely black. The genæ divided from the submentum and defined behind by a deep, oblique sulcus. The suborbital channel to receive antennæ single. Anterior tibiæ bidentate)......... *Euryscaphus.*

c. Lower edge of orbit not prominent or projecting forward.

d. Elytra costate on each side near lateral margin. Anterior tibiæ tridentate........ *Philoscaphus.*

e. Anterior tibiæ tridentate, inferior ridge short, oblique, not extending forward past second large external tooth. Elytra foveate, or with a single row of strong punctures down middle of each, or *(L. cyaneum,* Fabr.) quadripunctate............ *Laccopterum* *f.* Anterior tibiæ bi- or tridentate ;* anterior femora with a puncture near lower margin of inner side towards apex. Elytra smooth (either quadri-, bi-, or impunctate) *Carenum.*

g. Form elongate. Anterior tibiæ bidentate; anterior femora without a puncture near lower margin of inner side towards apex.

h. Antennæ moniliform............................ *Neocarenum.*

hh. Antennæ filiform................................ *Neoscaphus.*

aa. Lateral border of elytra narrow, and neither reflexed nor thickened to form an upturned projection at each shoulder.

i. Labrum and clypeus emarginate.............. *Carenidium.*

ii. Labrum and clypeus truncate................ *Conopterum.*

AA. Anterior tibiæ with outer apical angle projecting strongly forward, the external edge not dentate *(unidentate).*

k. Front with a strong longitudinal sulcus on each side between the eyes.................. *Monocentrum.*

kk. Frontal sulci not extending backwards between the eyes.............................. *Teratidium.*†

Genus SCARAPHITES.

As a beginning towards tabulating the species of this genus I offer the following synoptic list of the species now in my possession.

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* *C. rectangulare*, Macl., and *C. tibiale*, Sl., have the anterior tibiæ pluridentate externally, but the teeth above the three large ones are in reality merely strongly developed processes of the exterior ridge; there are indications of these more or less prominent in other species—*e.g.*, *C. virescens*, Sl.

† In *Teratidium* the frontal sulci are weakly developed, and only show in that part of their course which turns obliquely outwards in front; the part behind the anterior bend, which is so strongly marked in other *Carenides*, being wanting.

a. Anterior tibiæ with second external tooth not nearer apex than where inner apical spine rises. (Apex of intermediate tibiæ wide, a strong acute long spur projecting outward from just above apex; the external edge armed with two short, prominent, acute teeth above the apical spur).. *Sc. laticollis*, Macl.

aa. Anterior tibiæ with second external tooth nearer apex than where inner apical spine rises.

b. Lateral border of elytra not forming a thickened fold at humeral angles.................................. *Sc. pacificus*, Sl.

bb. Lateral border of elytra folded over and thickened at humeral angles.

c. External apical spur of intermediate tibiæ obtuse.

d. Pre-ocular sulcus deeply marked, a strong sinuosity between it and anterior angles of head.................. *Sc. assimilis*, Sl.

dd. Pre-ocular sulcus deeply marked, no sinuosity between it and anterior angles of head.......................... *Sc. crenaticollis*, Macl.

cc. External apical spur of intermediate tibiæ acute.

e. Post-ocular prominences projecting strongly outwards beyond the eyes, their anterior margin truncate.. *Sc. rotundipennis*, Dej.

ee. Post-ocular prominences projecting but little beyond eyes, their anterior margin rounded off......... { *Sc. macleayi*, Westw.
Sc. **insulanus*, Sl.

SCARAPHITES LATICOLLIS.

Scaraphites laticollis, Macl., Trans. Ent. Soc. N.S.W. 1866, i. p. lvi.; *Sc. gigas*, Casteln., Trans. Roy. Soc. Victoria, 1868, viii. p. 132.

Sc. laticollis, Macl., has a wide range, being found at King's Sound and also (as recently reported by the Rev. Thos. Blackburn in his notes on the *Coleoptera* of the Elder Exploring Expedition) in the Murchison district of West Australia. A comparison of Count de Castelnau's description of *Sc. gigas* with specimens of *Sc. laticollis*, Macl., leaves hardly any doubt in my mind but that the two names have been founded on one species. De Castelnau's specimen seems to have been a very large one (23 lines in length); however, I have seen a specimen of *Sc. laticollis* from King's Sound in Mr. C. French's possession which measured 21 lines in length, and know that mere size is a very unreliable character in many species among the *Carenides.*

SCARAPHITES ASSIMILIS, n.sp.

A single specimen is in my collection labelled "Fowler's Bay," which I had formerly considered *Sc. hirtipes*, Macl., but from comparison with Sir William Macleay's type in the Macleay Museum, Sydney, I find it to be a closely allied but different species. Its dimensions are—length 30, breadth 13·5; head, 5·25 × 9; prothorax, 6·5 × 11·5; elytra, 14·5 × 13·5 mm.

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* It seems likely *Sc. insulanus*, Sl., should be united with *Sc. macleayi*, Westw.; I have only a single specimen of each; these present slight differences, but probably a comparison of a greater number of specimens would show them to be merely one species. It is worthy of note that the late H. W. Bates has recorded *Sc. macleayi* from Tasmania (Cist. Ent., 1878, II. p. 325); and Mr. Olliff from Lord Howe Island (Mem. Aust. Mus. 1889).

Comparing it with the specimen of *Sc. hirtipes*, Macl., alluded to below, the following differences may be noted :—

The lateral margins of the head have a well marked sinuosity on each side just in front of the pre-ocular sulcus; the prothorax is much more strongly rounded off to the anterior angles; the elytra are proportionately wider and more rounded on the sides, with the border forming a strong humeral fold, the posterior margin of which forms with the border a strong sinuosity. The tibiæ are thickly fringed with reddish hair; the posterior are thick with their external edge convex in the middle.

SCARAPHITES HIRTIPES.

Sc. hirtipes, Macl., l.c., p. 148; *Sc. crenaticollis*, Macl. l.c., p. 147.

A single specimen of a species of *Scaraphites* which I found tolerably abundant under logs on the sand hummocks at Cape Otway in 1881 is in my collection named *Sc. crenaticollis*, Macl., by me from comparison with Sir William Macleay's type.* Its dimensions are: length 28, breadth 11; head 4·5 × 7·5; prothorax 5·25 × 9; elytra 13 × 11 mm. It differs from *Sc. hirtipes*, Macl., principally as noted above under the heading of that species; the following features are, however, worthy of note :—The anterior part of the sides of the head narrow inwards on each side from the pre-ocular process to the anterior angles of the clypeus without any sinuosity; the humeral fold of the elytral border is weakly developed, and joins the border behind by a gentle and even slope; the posterior tibiæ are not thick, and their external edge is not convex; the four posterior tibiæ are fringed with strong hair.

Genus EURYSCAPHUS.

In view of a new species, *F. atratus* (described below), offering very decided affinities to the typical Carenums, it seems needful to offer a short definition of this genus, giving characters, a combination of which seems to be all that separates the species belonging to *Euryscaphus* from all other divisions of the *Carenides.*

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* Having been in Sydney while this paper was passing through the press I have been able to compare this specimen and that named *Sc. assimilis*, Sl., above with the types of *Sc. hirtipes* and *Sc. crenaticollis* in the Macleay Museum, and so to convince myself that the two latter are really one species; of the two names *hirtipes* seems the more appropriate.

Form generally very broad and heavy; colour entirely black; upper surface smooth; sub-orbital channel to receive antennæ single; lower edge of orbit overhanging the sub-orbital channel and prominent (usually projecting) in front; a deep oblique groove defining the genæ behind and dividing them from the submentum and gulæ; anterior tibiæ bidentate.

The species of this genus are in some confusion owing to the vagueness of de Castelnau's descriptions; this confusion has been further increased by the difference in shape between the sexes, resulting in the ♂ and ♀ of certain species having been described as different species—*e.g.*, *E. bipunctatus*, Macl., = ♂ of *E. obesus*, Macl. Having seen some of de Castelnau's types in the Howitt Collection at the Melbourne University, and having collected specimens, both male and female, of *E. obesus*, Macl., I am enabled to throw a little light on some of these points. In the genus *Euryscaphus* the ♂ usually has the elytra more emarginate at the base, and broader and more strongly rounded on the sides than the ♀, so that it becomes necessary in describing a species of this genus to determine and record the sex of the type. It may be worth noting here that I consider, from the descriptions, Mr. Blackburn's three species *E. tatei, E. chaudoiri,* and *E. sulcicollis* to be founded on female specimens.

The following synoptic list of the species without discoidal punctures on the elytra now in my possession is offered as a contribution towards settling a few of the difficulties in the way of determining at least some of the species of the genus. The table is unavoidably founded on female specimens, no male specimen of four of the species being available.

a. Posterior angles of prothorax rounded, the base rounded between them.
  b. Reflexed border of elytra ending at humeral angle and forming a thick upturned humeral projection.

Size very large; elytra broad, widely rounded behind .... *E. waterhousei*, Macl.

Size moderate; elytra narrow, and narrowly rounded behind .... *E. atratus*, Sl.

bb. Reflexed border of elytra extending past humeral angle on to base, narrow, and not forming a thickened projection at shoulder.

c. Posterior margin of prothorax rounded and decidedly lobate, posterior angles not marked ... *E. minor*, Macl.

cc. Posterior margin of prothorax very lightly rounded, hardly lobate, the posterior angles rounded, but well marked.

Elytra lightly convex, narrowed to apex .... *E. politus*, Sl.

Elytra very convex, widely rounded at apex .... *E concolor*, Sl.

aa. Posterior angles of prothorax sharply upturned and rectangular, the base truncate between them .... *E. subsulcatus*, Blkb.

EURYSCAPHUS WATERHOUSEI.

♂. *Scaraphites waterhousei*, Macl., Trans. Ent. Soc. N.S.W., 1864, I. p. 147. ♀. *Euryscaphus titanus*, Sl., Proc. Linn. Soc. N.S.W., 1889, iv. (2) p. 1288.

I have recently seen a specimen of *E. waterhousei*, Macl., from the MacDonnell Ranges, belonging to Mr. C. French. It is a male, and from a comparison of it with the type of *E. titanus*, Sl., I am able to state without doubt that the latter is merely the female of *E. waterhousei*; the differences on which I separated it from that species being entirely sexual.

EURYSCAPHUS ATRATUS, n.sp.

♀. Oblong-oval, convex, smooth, black; prothorax subcordate; elytra impunctate, humeral angles thick, and forming a prominent upturned projection.

Head transverse (5 × 8·5 mm.), smooth (excepting for a few minute scratches); frontal sulci not connected behind, parallel forward, curving obtusely out in front in a linear course; eyes not prominent; lower margin of orbit projecting forward in a short obtuse prominence; two supra-orbital punctures on each side. Antennæ subfiliform, thick; second joint very short; apical joint obtuse. Prothorax subcordate (7 × 11 mm.), convex; sides lightly rounded before posterior angles, gently and obliquely narrowed behind them, lightly sinuate between posterior angles and middle of base; posterior angles rounded off; base rounded, widely and strongly produced backwards; anterior angles rounded, very lightly advanced; anterior margin sinuate; border thick, reflexed, hardly more prominent at posterior angles, narrow without any median sinuosity on base; a slight triangular projection at the sinuosity on each side of base; marginal channel narrow; median line lightly impressed; a lightly-marked transverse impression across the base; two marginal punctures, the anterior rather nearer the anterior angles than usual in the genus. Elytra impunctate, ovate (16 × 12 mm.), widest a little before middle, lightly rounded on sides, a little narrowed to base, greatly narrowed to apex, convex; base almost truncate; shoulders prominent; the border forming a thick obtuse projection at the humeral angles; margin very narrow on sides and apex, wider, but not flattened, behind shoulders; border reflexed, not extending past humeral angles; a row of small punctures on base of each elytron; a row of fine punctures along lateral margins, these more closely placed towards base; suture not forming an impression. Prosternum deeply channelled between coxæ. Anterior tibiæ bidentate, three fine external teeth above the two large ones.

Length 31-33, breadth 12-13 mm.

Hab.—Bourketown district, Queensland.

I am indebted to C. French, Esq., for the specimen described above; another (also a ♀) is in the possession of that gentleman.

A very distinct species; it seems most allied to *E. waterhousei*, Macl., among previously described species, but the two species have not much resemblance. Their great difference in size in itself thoroughly distinguishes them from one another.

EURYSCAPHUS MINOR.

E. minor, Macl., Trans. Ent. Soc. N.S.W., 1865, I. p. 189; *Scaraphites affinis*, Casteln., Trans. Roy. Soc. Victoria, 1868, VIII. p. 130; *E. arenarius*, Sl., Proc. Linn. Soc. N.S.W., 1888, III. (2) p. 1108.

I have previously published the identity of *E. arenarius*, Sl., with *E. minor*, Macl.; and have now to add *Scaraphites affinis*, Casteln., as also a synonym. The type of *Sc. affinis* is in the Howitt Collection at the Melbourne University, where I was able in November last year, through the kindness of Professor Spencer, to examine it; a comparison of the type with a specimen of *E. minor* showed it to be merely that species. It may also be noted that I found specimens of *E. minor* labelled *Scaraphites lucidus*, Chaud., in the Howitt Collection; this seems certainly a case of mistaken identity, for the description of *Sc. lucidus* is undoubtedly that of a true *Scaraphites*.

EURYSCAPHUS POLITUS, n.sp.

♀. Robust, black, shining, smooth; elytra strongly emarginate at base, narrowed to apex, impunctate.

Head subquadrate (5 × 7·75 mm.), smooth; frontal sulci connected behind by a curved impression, subparallel, sinuous forward, curving out in front in a linear sinuous course; preocular sulcus well-marked; eyes round, rather prominent; lower margin of orbit projecting lightly and roundly in front; two supra-orbital punctures on each side. Antennæ filiform; apical joint fusiform. Prothorax transverse (5·75 × 10·25 mm.), depressed, sides rounded; anterior angles strongly and roundly advanced; anterior margin very lightly sinuate; posterior angles rounded, but well-marked; base short, bisinuate, the middle very lightly and broadly produced backwards; border wide, its edge hardly upturned in front, becoming more decidedly so backwards, very strongly and obliquely reflexed at posterior angles, narrower and with a very light median sinuosity on middle of base; marginal channel wide; median line lightly impressed; some transverse striolæ across median line near base, but basal part of prothorax hardly defined; two marginal punctures on each side as usual. Elytra broadly ovate (13 × 11·5 mm.), widest before the middle, lightly rounded on sides, very little narrowed to base, decidedly narrowed to apex, convex; base lightly and broadly emarginate; shoulders not prominent; humeral angles well marked, obtuse, rather square; margin narrow on sides, wider towards apex, wide and flat behind shoulders; border reflexed, very strongly so at shoulders, extending past humeral angles, not ending in a thickened humeral projection; a row of small punctures on base of each elytron; a row of lightly impressed punctures along lateral margins; suture well-marked. Prosternum almost flat between the coxæ, with a very light median excavation. Anterior tibiæ bidentate, three or four small external teeth above the two large ones.

Length 27, breadth 11·5 mm.

Hab.—MacDonnell Ranges, Central Australia.

Received from C. French, Esq.

This species is allied to *E. minor*, Macl., from which the broader prothorax with more strongly marked posterior angles and the middle of the base less produced backwards distinguish it. From *E. concolor*, Sl., also an allied species, the far less convex elytra much more narrowed to the apex at once separate it. There seems a possibility that *E. politus* may prove to be *Scaraphites hopei*, Casteln., as Count de Castelnau says that species might be taken for *E. minor*, Macl., and *E. politus* has a decided superficial resemblance to *E. minor;* but *Sc. hopei* is said to have the "humeral angles rounded, and not advanced"; the inference being suggested that de Castelnau considered these angles advanced, but not rounded, in *E. minor;* in *E. politus* they are less rounded but rather more advanced than in *E. minor*. De Castelnau's brief note on *Sc. hopei*, which cannot be called a description, also gives me the impression that it should have the prothorax more rounded behind than *E. minor*, not less so, as in *E. politus*.

EURYSCAPHUS CONCOLOR, n.sp.

Robust, black, shining; elytra very convex, broadly rounded at apex, impunctate.

♂. Head subquadrate, transverse (6 × 8·75 mm.), smooth; frontal sulci connected behind by a faint curved impression, subparallel forward, curving obtusely out in front in a sinuous course; pre-ocular sulcus well marked, oblique; eyes round, rather prominent; lower margin of orbit lightly and obtusely projecting in front; one supra-orbital puncture on each side. Antennæ filiform; apical joint narrow, fusiform. Prothorax short, transverse (6·5 × 11·5 mm.); sides rounded; anterior angles broadly and lightly advanced; anterior margin lightly sinuate; posterior angles rounded, but strongly marked; base short, bisinuate, the middle broadly and lightly produced backwards; border wide, reflexed, very strongly so at posterior angles, narrow with an obsolete median sinuosity on middle part of base; marginal channel wide; median line lightly impressed; a transverse striola defining basal part; two marginal punctures on each side, as usual in the genus. Elytra broad (13·5 × 13·25 mm.), strongly rounded on sides and at apex, very convex; base broadly and decidedly emarginate; humeral angles well marked, almost square; margin narrow on sides, wider towards apex, wide and flat behind shoulders; border reflexed, very strongly so at shoulders, extending past humeral angles, not ending in a thickened humeral projection; a row of small punctures on base of each elytron; a row of lightly impressed punctures along lateral margins; suture linear, not deeply impressed. Prosternum widely channelled between the coxæ. Anterior tibiæ bidentate; three small teeth above the two large ones.

Length 30, breadth 13·25 mm.

♀ agreeing with ♂ in everything except the shape of the elytra. Head 5·75 × 9 mm. Prothorax 6·5 × 12 mm. Elytra broad (15·5 × 13·5 mm.), lightly rounded on sides, hardly narrowed to base, strongly declivous behind and on sides; base subtruncate, lightly emarginate; otherwise as in ♂. Length 15·5, breadth 31·5 mm.

Hab.—Fowler Bay, South Australia.

Two specimens (♂ and ♀) have been sent to me by C. French, Esq., who has kindly given me one; the ♂ is in his collection.

As usual in the genus, the ♂ in this species has the elytra much more dilatate on the sides than the ♀, and more emarginate at the base, which gives them an altogether shorter appearance. The elytra of the ♀ are much more declivous towards the sides and apex, and have altogether a more decidedly convex and less rotundate form than those of the ♂. It is allied to *E. politus*, Sl., and, comparing the ♀, it may be noted that the prothorax is the same shape, but *E. concolor* has the elytra much more convex, less rounded on the sides, and far more widely rounded at the apex.

EURYSCAPHUS OBESUS.

♀. *Scaraphites obesus*, Macl., Trans. Ent. Soc. N.S.W., 1863, i. p. 65; *E. ferox*, Sl., Proc. Linn. Soc. N.S.W., 1888, iii. (2), p. 1109. ♂. *E. bipunctatus*, Macl., l.c. p. 189; *Scaraphites howittii*, Casteln., Trans. Roy. Soc. Victoria, 1868, viii. p. 130.

In spite of the difference in shape between *E. obesus*, Macl., and *E. bipunctatus*, Macl., I am certain they are merely the sexes of one species. It is found over a large area of country, I myself having taken it on the Lachlan, Murrumbidgee, and Murray rivers; the type of *E. bipunctatus* came from South Australia, and the type of *Scaraphites howittii*, Casteln., from Port Lincoln, S.A. In all, I have collected thirteen specimens of this species, the sex of all of which I have determined, and have found eight, identical with *E. bipunctatus*, to be males; and five, identical with *E. obesus*, to be females. I have found specimens of both sexes at the one spot about thirty miles south of the Murrumbidgee River at Narrandera. Like *E. minor*, Macl., it lives solitarily in holes about a foot long dug by the occupant, and usually placed under a fallen log in dry forest country. The type of *Scaraphites howittii*, Casteln., in the Howitt Collection, I have compared with a male specimen of *E. obesus*, Macl., and found it the same species.

Genus LACCOPTERUM.

It seems clear that *Carenum cyaneum*, Fabr., should be placed in this genus; its evident affinity being to *Laccopterum deauratum*, Macl. In his review of the *Carenides* in 1887, Sir William Macleay omitted to place his *Carenum digglesi* in this genus which is its proper place. *Carenum multiimpressum*, Casteln., is another species, evidently a *Laccopterum*, that Sir William Macleay has not included in his list of the genus. In Mr. Masters' valuable Catalogue all these species appear under the genus *Carenum*.

Genus CARENUM.

As explained in the introductory note to this paper, I now prefer to use the generic term *Carenum* in as wide a sense as possible, rather than to break up the groups of species that can be included in it into genera; if the latter course be adopted it will become necessary, if any degree of uniformity of classification is to be maintained, to add several new generic names to the *Carenides*, there being several described species which are certainly as much entitled to be considered types of new genera as those on which the genera excluded in this paper have been founded; further, it will be noticed on examining a full series of species, that sometimes species which seem so different as apparently to justify their being placed in different genera, are so linked together by other species that it becomes almost impossible to indicate any break in the chain. Indeed the whole tribe of the *Carenides* proves so closely connected, as our knowledge of the immense number and variety of the species increases, that it becomes more and more difficult to find good and satisfactory distinctions between the recognised genera.

The genus *Carenum*, as recognised in this paper, contains, at present, ninety-six described species; these I have endeavoured to arrange in natural groups in the tabular list which follows. The species are believed to be in their proper places according to the system of classification adopted; those species, the position of which I have felt unable to be confident about, are noted separately after the table.

Table grouping the species of the genus Carenum.

I. Suborbital channels to receive antennæ straight, single, not dividing the genæ from the gulæ. Penultimate joint of labial palpi narrow, and evidently longer than last joint. Anterior tibiæ tridentate *(sometimes with some smaller teeth above the three large ones)* or bidentate, with some small teeth above the two large ones. Inflexed margin of elytra wide behind first ventral segment.

A. Reflexed border of elytra extending past humeral angle on to base, narrowly reflexed and not forming a thickened projection at shoulder. *C. brevicolle* group

B. Reflexed border of elytra ending at humeral angle and forming a thickened upturned humeral projection.

a. Elytra impunctate.

b. Prothorax with posterior angles prominent and strongly marked; the base almost truncate on each side behind them, and with a short median lobe. Anterior tibiæ tridentate. *C. transversicolle* group.

bb. Prothorax with posterior angles rounded off.

c. Prothorax with a well-marked basal lobe. Anterior tibiæ tridentate. *C. macleayi* group.

cc. Prothorax without any basal lobe. Anterior tibiæ bidentate. *C. lævipenne* group.

aa. Elytra bipunctate.

d. Anterior tibiæ tridentate, with middle of lower side elevated into a serrate ridge *(inferior ridge)* extending from near base to apex.

e. Prothorax with posterior angles prominent, almost rectangular; the base truncate. *C. rectangulare* group.

ee. Prothorax with posterior angles rounded off.

f. Frontal sulci short, subparallel. *C. dispar* group.

ff. Frontal sulci diverging strongly backwards.

g. Two supra-orbital punctures near each eye; prothorax with marginal channel tripunctate. *C. campestre* group.

gg. One supra-orbital puncture near each eye; prothorax with marginal channel bipunctate. *C. habitans* group.

dd. Anterior tibiæ bidentate; the inferior ridge, when viewed from below, almost parallel with exterior ridge and not extending forward past upper large external tooth. The apical part of the lower side of anterior tibiæ forming a broad apical plate. *C. marginatum* group.

II. Suborbital channel to receive antennæ wide, divided longitudinally in middle by an oblique ridge, lower part of channel dividing the genæ from the gulæ. Penultimate joint of labial palpi short, thick. Elytra quadri-punctate. Anterior tibiæ bidentate.

h. Inflexed margin of elytra not narrow behind first ventral segment. *C. interruptum* group.

hh. Inflexed margin of elytra narrow behind first ventral segment.

i. Frontal sulci not diverging backwards to define the space between them and the eyes. *C. scaritioides* group.

ii. Frontal sulci diverging backwards and defining posterior margin of the space between them and the eyes.

k. The space betweeen the frontal sulci having its base rounded and not filling all the interval between their posterior extremities. *C. bonellii* group.

kk. The space between the frontal sulci having its base truncate and filling all the interval between their posterior extremities. *C. 4-punctatum* group.

List of the species of the genus *Carenum* arranged in groups according to the table given above.

C. BREVICOLLE GROUP.

C. brevicolle, Sl.

C. TRANSVERSICOLLE GROUP.

C. transversicolle, Chaud.

C. MACLEAYI GROUP.

C. macleayi, Blackb.

C. LÆVIPENNE GROUP

C. ineditum, Macl.
C. lævipenne, Macl.
C. politum, Westw.

C. RECTANGULARE GROUP.

C. rectangulare, Macl.
C. tibiale, Sl.

C. DISPAR GROUP.

C. breviforme, Bates.
C. cupreo-marginatum, Blackb.
C. dispar, Macl.
C. habile, Sl.
C. iridescens, Sl.
C. opulens, Sl.
C. porphyreum, Bates.
C. rugatum, Blackb.
C. smaragdulum, Westw.
C. subcyaneum, Macl.
C. virescens, Sl.

C. HABITANS GROUP.

C. habitans, Sl.

C. CAMPESTRE GROUP.

C. campestre, Macl.
C. coruscum, Macl.
C. distinctum, Macl.
C. elegans, Macl.
C. odewahni, Casteln.
C. rufipes, Macl.
C. speciosum, Sl.
C. splendens, Casteln.

C. MARGINATUM GROUP.

C. batesi, Masters.
C. carbonarium, Casteln.
C. convexum, Chaud.
C. decorum, Sl.
C. frontale, Macl.
C. fugitivum, Blackb.
C. ianthinum, Macl.
C. kingi, Macl.
C. lævigatum, Macl.
C. laterale, Macl.
C. marginatum, Boisd.
C. murrumbidgense, Macl.
C. nitescens, Macl.
C. planipenne, Macl.
C. politulum, Macl.
C. propinquum, Macl.
C. puncticolle, Macl.
C. punctulatum, Macl.
C. striato-punctatum, Macl.
C. subporcatulum, Macl.
C. subplanatum, Bates.

C. MARGINATUM GROUP (*contd.*).

C. subcostatum,* Macl.
C. terræ-reginæ, Macl.
C. vicinum, Sl.
C. viridi-marginatum, Macl.

C. INTERRUPTUM GROUP.

C. anthracinum, Macl.
C. cyanipenne, Macl.
C. ebeninum, Casteln.
C. inconspicuum, Blackb.
C. interruptum, Macl.
C. obscurum, Macl.
C. obsoletum, Macl.
C. purpureo-marginatum, Macl.
C. sexpunctatum, Macl.

C. SCARITIOIDES GROUP.

C. ambiguum, Macl.
C. atronitens, Macl.
C. devastator, Casteln.
C. ignotum, Sl.
C. intermedium, Westw.
C. nigerrimus, Macl.
C. oblongus, Macl.
C. scaritioides, Westw.
C. striato-punctulatum, Macl.
C. subquadratum, Macl.

C. BONELLII GROUP.

C. affine, Macl.
C. bonellii, Brullé.
C. brisbanense, Casteln.
C. chaudoiri, Macl.
C. coracinum, Macl.
C. opacum, Macl.
C. ovipenne, Macl.
C. pusillum, Macl.
C. simile, Macl.
C. submetallicum, Macl.
C. triste, Macl.

C. QUADRIPUNCTATUM GROUP.

C. quadripunctatum, Macl.
C. lucidum, Macl.
C. angustipenne, Macl.

Species of *Carenum* omitted from the list above, because no specimen has been available for reference, and their position seems doubtful:—

C. perplexum, White, seems a very isolated species; I doubt if it is very closely allied to *C. lævipenne*, Macl.

Platythorax interioris, Sl., seems to offer affinities to both the *C. dispar* and *C. transversicolle* groups.

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* *C. subcostatum* seems more naturally placed in the *C. marginatum* group than anywhere else; sometimes the discoidal punctures of the elytra are present.

Calliscapterus foveolatus, Macl., and *C. viridiæneus*, Macl., are not likely to belong to any of the "groups" given above. They are probably more allied to *Laccopterum cyaneum*, Fabr., than to any other described Carenid.

Carenum parvulum, Macl., is probably allied to *Laccopterum cyaneum*, Fabr., rather than to *Carenum dispar*, Macl., or *C. campestre*, Macl.

Carenum nickleri, Ancey, is too vaguely described for its identification to be possible without an actual inspection of the type. It seems allied to *C. campestre*, Macl., but that it is a previously undescribed species seems very doubtful, and the description certainly bears no internal evidence of such being the case.

Carenum gawlerense. This name is not found in Mr. Masters' Catalogue, but it occurs in Sir William Macleay's list of the genus *Carenoscaphus*,* where it is attributed to de Castelnau. It cannot, however, be recognised, the only authority † for it being merely a suggestion by Sir William Macleay.

Carenum sumptuosum, Westw., and *Carenoscaphus viridissimus*, Macl., are elongate species with affinities towards *Carenum quadripunctatum*, Macl.; I am doubtful of their position. The Rev. Thomas Blackburn has recorded his opinion that *C. sumptuosum* should be considered as belonging to the genus *Eutoma*.‡

Carenum lepidum, Sl., requires, I think, a separate group. Unfortunately my specimen has been accidentally destroyed.

Carenum de visii, Macl., is a remarkable species. I remember seeing the type in the Brisbane Museum in the year 1888, when I was struck by its great dissimilarity to any other *Carenum* I had ever seen. Speaking from memory I think it is more allied to the species named *Euryscaphus atratus* in this paper than to any other known Carenid.

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* P.L.S.N.S.W., 1887, ii. (2) p. 120.

† Trans. Ent. Soc. N.S.W., 1869, ii. p. 59.

‡ P.L.S.N.S.W. 1889, iv. (2), p. 445.

CARENUM BREVICOLLE, n.sp.

Broad, depressed; prothorax twice as wide as long, strongly rounded on sides, subtruncate behind, posterior angles prominent, squarely marked; elytra widely truncate at base, broadly rounded at apex, impunctate, the margin not forming a projection at shoulders, inflexed margin wide; anterior tibiæ strongly tridentate.

Head, undersurface (including inflexed margins of elytra), and legs black, prothorax purple-black, widely margined with green, elytra dark purple, with greenish reflections towards sides, margin green. Head subquadrate (4·5 × 6·25 mm.), smooth; frontal sulci deep, curved, diverging a little backwards, turning lightly out in front in a linear course; pre-ocular sulcus strongly marked; eyes deeply set in orbits, not prominent; one supra-orbital puncture on each side. Antennæ light, subfiliform, a little compressed; second joint shorter than third; apical narrow, elongate-oval. Prothorax twice as wide as long (4·75 × 9·5 mm.), depressed; sides strongly rounded; anterior margin very lightly emarginate, the angles roundly advanced; posterior angles rounded, but very prominent and strongly marked; base almost truncate, bisinuate, the middle very widely and shortly produced backward, the sinuosity on each side very light; border widely reflexed, very prominently so at posterior angles, narrow and without any sinuosity on middle part of base; marginal channel wide, obsolete on middle of base; median line strongly impressed; two marginal punctures on each side as in *C. marginatum*, &c. Elytra broad (12·75 × 9·75 mm.), lightly rounded on sides, hardly narrowed to base, widely rounded at apex, lightly convex; base wide, truncate; humeral angles rounded, but well-marked; margin wide, becoming wider towards apex and near shoulders; border reflexed, extending past humeral angles, very lightly turned back, but not forming any projection, at shoulders; a row of punctures on base of each elytron; a row of strongly impressed, separate punctures along lateral margins; suture strongly impressed, linear; inflexed margin wide. Prosternum deeply and widely channelled between coxæ. Legs light; anterior tibiæ tridentate; the teeth long, light, and wide apart; exterior ridge with two or three projections above large teeth;

inferior ridge strongly serrate, extending along middle of lower side of tibiæ to apex; apical plate with a long acute tooth projecting below tarsus; intermediate tibiæ with a very short external tooth at apex.

Length 25, breadth 9·75 mm.

Hab.—Nullabar Plains, Eucla District. A single specimen in the collection of C. French, Esq., Melbourne.

An isolated species; the short wide prothorax rounded on the sides and almost truncate behind, and the broad rather depressed elytra without discoidal punctures and with the lateral border extending on the base past the humeral angle are noticeable features that thoroughly separate it from all described species of the genus. It is the only species of the genus *Carenum* known to me in which the lateral border of the elytra is not thickened to form an upturned projection at the shoulders.

CARENUM LÆVIPENNE.

C. lævipenne, Macl., Trans. Ent. Soc. N.S.W. 1863, i. p. 59; *C. lævicolle*, Sl., Proc. Linn. Soc. N.S.W. 1888, iii. (2), p. 1116.

I am now able to compare the type of *C. lævicolle*, Sl., with a specimen of *C. lævipenne*, Macl., and can find no difference between them. It is impossible to think the locality given by me for *C. lævicolle*, viz., Johnstone River, Queensland, can be a correct one; I received my specimen, as coming from the Johnstone River, among a lot of other Coleoptera from different parts of Australia, but do not know the authority for the locality.

It may be noted that in *C. lævipenne*, Macl., the supra-orbital punctures of the head and the marginal punctures of the prothorax are wanting; in *C. ineditum*, Macl., an allied species, a single supra-orbital puncture is present, but there is no trace of any punctures along the marginal channel of the prothorax.

CARENUM TIBIALE, n.sp.

♀. Robust; prothorax widely margined, truncate on base, the posterior angle sub-rectangular; elytra bipunctate, convex, greatly raised above the plane of the prothorax, inflexed margin wide; anterior tibiæ multidentate externally.

Black, polished; prothorax and elytra with a narrow green margin. Head subquadrate (4 × 6·5 mm.), smooth; frontal sulci deep, parallel backwards, curving outwards in front in a deeply marked course; pre-ocular sulcus very lightly impressed; pre-ocular process small; clypeus truncate behind labrum, the lateral projections strong and triangular; one supra-orbital puncture on each side; eyes deeply set in orbits, not prominent. Mandibles long and strongly toothed. Mentum wide; the median tooth strong, keeled. Palpi with last joint triangular; penultimate joint of labial long, narrow, plurisetose; second and third joints of maxillary with two or three strong setæ in front. Antennæ slender, lightly compressed, not thicker towards apex; second joint much shorter than third; apical joint short, obtuse. Prothorax transverse (5·4 × 9·3 mm.), depressed, gently declivous towards sides in front; sides rounded, hardly at all so in middle of their length, more decidedly and equally so towards anterior and posterior angle; anterior margin truncate between anterior angles, these broadly and roundly advanced; posterior angles sub-rectangular, prominent, their summit rounded; base truncate, very lightly bisinuate, the middle part very lightly and widely produced backwards; border widely reflexed on sides, very prominently so at posterior angles, narrower and without any sinuosity on middle of base; marginal channel wide, except across middle of base; median line strongly impressed and placed in a longitudinal depression; two setigerous punctures on each side, both placed on the marginal border a little within its edge, the anterior a little behind the anterior angle, the posterior a little behind the posterior angle. Elytra subcordate (13·75 × 9·6 mm.), widest a little behind the shoulders, truncate on base, rounded at shoulders, widely rounded behind, convex, very declivous behind; border widely reflexed, indistinct on the basal declivity, thickened at each humeral angle to form a wide, short, hardly prominent projection; a strong puncture on the disc of each elytron just above the posterior declivity; basal declivity very deep and abrupt; two or three punctures, in a row, on internal half of base of each elytron; a row of fine punctures along lateral margins; suture forming a deeply impressed channel; inflexed margin very wide. Prosternum widely channelled between the coxæ, with two setigerous punctures on each side near inner margin of coxæ. Four posterior legs light; anterior tibiæ not wide at apex, pluridendate externally; the three anterior teeth very strong, those above them (four) smaller but prominent; inferior ridge strongly and closely serrate, extending along whole length of under side of tibiæ; apical plate narrow, with an acute projection from apex below tarsus; intermediate tibiæ ciliate, without an external spur at apex.

Length 25, breadth 9·6 mm.

Hab.—MacDonnell Ranges, Central Australia.

For the single specimen in my collection I am indebted to C. French, Esq.

The affinity of this species is evidently towards *C. rectangulare*, Macl., but it is very distinct from, and has apparently but little resemblance to, that species.

CARENUM IRIDESCENS, n.sp.

Elliptic-oval, convex, smooth, shining; elytra bipunctate with wide inflexed margins and weakly developed humeral projections; legs light, anterior tibiæ tridentate.

Head, under surface and legs black; prothorax widely margined with green, the disc black; elytra metallic green with bluish reflections becoming dark blue near suture, inflexed margins greenish-black. Head subquadrate (3·3 × 5·1 mm.), smooth; frontal sulci short, straight and lightly divergent backwards, curving outwards in front in a lightly marked course; pre-ocular sulcus wide, shallow; pre-ocular prominence prominent; eyes convex, not prominent; one supra-orbital puncture on each side. Antennæ slender, lightly compressed; apical joint subfusiform. Prothorax transverse (4 × 6·6 mm.), convex, rounded on sides; anterior margin truncate; anterior angles shortly and obtusely advanced; posterior angles rounded off; base shortly and narrowly lobate in middle, a light sinuosity on each side of lobe; border reflexed, a little wider at posterior angles, narrow and obsoletely emarginate on basal lobe; marginal channel narrow along sides, wider at posterior angles, not crossing basal lobe; median line strongly impressed; no trace of the usual marginal punctures. Elytra oval, hardly as wide as prothorax (10·25 × 6·5 mm.), convex; shoulders and base rounded; base roundly declivous to peduncle; apex widely rounded; lateral margin wide behind shoulders; border hardly reflexed, ending at shoulders in a very short upturned projection; two or three punctures on base of each elytron; a row of umbilical punctures along lateral margins; a strong puncture on each elytron, placed at about the middle of the width, just before the posterior declivity; suture strongly impressed. Prosternum widely channelled between the coxæ, two or three punctures on each side near inner margin of coxæ. Anterior tibiæ narrow, tridentate, a short prominent triangular tooth above the three large ones; inferior ridge serrate, a strong tooth projecting downwards from apex of apical plate; intermediate tibiæ ciliate, without an external spur at apex.

Length 19, breadth 6·6 mm.

Hab.—Interior of South Australia.

The affinity of this species is to *C. rugatum*, Blkb., (naturally a smooth shining species variable in colour, being sometimes of a beautiful steel-blue), from which, however, it differs in colour and in the shape of the prothorax and elytra;—in *C. rugatum* the posterior angles of the prothorax are not so much rounded off and the sinuosity on each side of the basal lobe is far more strongly marked, and the elytra are wider and truncate at the base.

Given to me by C. French, Esq., as coming from the interior of South Australia. A second specimen, larger than the one described above, is in his collection.

CARENUM VIRESCENS, n.sp.

♂. Robust, convex; prothorax transverse, rounded at posterior angles; elytra broadly oval, bipunctate, inflexed margin wide; anterior tibiæ tridentate.

Shining; head black with a faint green reflection on gulæ, a small green spot on each side below supra-orbital puncture, suborbital channel green; prothorax very widely margined with green, the disc and middle of anterior margin black; undersurface black with green reflections on inflexed margin, episterna and anterior part of prosternum; elytra including inflexed margins green, a narrow part of the disc on each side of the suture blackish-blue; legs and body black; mesosternal episterna green. Head large, subquadrate (4·75 × 7 mm.), smooth; frontal sulci nearly parallel, diverging lightly backwards, turning sharply out in front in a well-marked linear course; pre-ocular sulcus well-marked; pre-ocular process small; eyes deeply set in orbit, not prominent. Antennæ slender, hardly compressed, attenuate to apex; second joint much shorter than third; apical narrow, elongate. Prothorax transverse, a little broader than elytra (5·8 × 9·5 mm.), subconvex; sides lightly rounded, narrowed in front; anterior margin very lightly emarginate, the angles strongly and roundly advanced; posterior angles rounded; base rounded, lobate, the sinuosity on each side of the lobe strongly marked, lobe narrow, lightly sinuate in middle; border widely reflexed, hardly wider at posterior angles, thick, and declivous in front, on basal lobe; marginal channel wide, not crossing the basal lobe; median line strongly impressed, linear; a strongly marked, arched, transverse line connecting the marginal channel of each side, and defining the basal lobe; two marginal punctures on each side, the posterior placed as usual, the anterior about mid-way between it and the anterior angle. Elytra barely as wide as prothorax, widely oval (13 × 9·3 mm.), strongly and evenly rounded on sides, convex; base truncate, declivous; margin wide, particularly on each side of apex; border strongly reflexed, obliquely declivous on base, thickened at each humeral angle to form a short, strong, out-turned prominence; a strong puncture on apical third of each elytron, about mid-way between margin and suture; basal declivity finely and irregularly punctate; a row of closely-placed, strong punctures along lateral margins; suture forming a deeply-marked channel; inflexed margin very wide.

Prosternum widely and lightly channelled between coxæ; a row of four or five setigerous punctures extending along each side of prosternum, near the coxæ, from base to a little in front of coxæ. Legs strong; anterior tibiæ tridentate, the upper tooth not prominent; three light external projections above large teeth; inferior ridge serrate, extending along middle of lower side of tibiæ to apex; apical plate with a strong acute tooth projecting from apex below the tarsus.

Length 26, breadth 9·5. mm.

Hab.—Murchison River District, West Australia.

In the collection of C. French, Esq.

This species has a strong general resemblance to *C. habitans*, Sl., from which, however, it can be readily distinguished; the frontal sulci not diverging strongly backwards, the prothorax more rounded on the sides, and more narrowed towards the front, with a more strongly marked basal lobe (which is lightly sinuate in the middle, not evenly rounded as in *C. habitans*), and the more convex elytra, with the sides less rounded behind the humeral angles, are among the features which help to distinguish them. A row of four or five setigerous punctures extends along each side of the prosternum, near the coxæ, from the base to a little in front of the coxæ; in *C. habitans* one or two setigerous punctures are found on each side of the prosternum, near the base.

CARENUM INTERRUPTUM.

C. interruptum, Macl., Trans. Ent. Soc. N.S.W., 1865, i. p. 181; *C. castlenaui*, Chaud., Ann. Soc. Ent. Belg., 1869, p. 141; *C. occultum*, Macl., Trans. Ent. Soc. N.S.W., 1871, ii. p. 97.

I have previously published the synonymy of *C. castelnaui*, Chaud., with *C. occultum*, Macl.,* and now have sufficient evidence to justify me in placing both as synonyms of *C. interruptum*, Macl. Specimens are in my collection from Goulburn and Merriwa (Upper Hunter), in N.S.W.; and from Wallangarra, in Queensland.

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* P.L.S. N.S.W., 1891, vi. (2) p. 431.

It may further be noted that I have collected specimens of *C. purpureo-marginatum*, Macl., at Coonabarabran (the original locality), and can find no satisfactory differences between it and *C. interruptum;* it may however perhaps be maintained as a geographical race, or variety. In regard to *C. sexpunctatum*, Macl. (= *C. arenarium*, Sl.) though a brighter and usually larger insect than *C. interruptum* it might also easily be looked upon as a variety of that species. I expect both *C. purpureo-marginatum* and *C. sexpunctatum* will ultimately be merged with *C. interruptum*, or reduced to the rank of varieties.

CARENUM SUBMETALLICUM.

C. submetallicum, Macl., Trans. Ent. Soc. N.S.W., 1871, ii. p. 98.

This is a distinct species from *C. brisbanense*, Casteln. Since publishing the opinion that they were synonymous* I have obtained a specimen of *C. brisbanense*, which I have been able to compare with the type of the species in the Howitt Collection, and so make sure of its identity. It differs from the specimen of *C. submetallicum* in my collection, being more brightly coloured, more elongate and parallel in shape, and more convex; the position of the anterior discoidal punctures of the elytra differs, being nearer the shoulders in *C. brisbanense* than in *C. submetallicum*.

Genus EUTOMA.

This section of the *Carenides* seems a difficult one to separate definitely from *Neocarenum*, and from the *quadripunctatum*, *scaritioides*, and *bonellii* groups of *Carenum*. To me it seems an artificial genus of doubtful value, but as it is generally recognised, and its use is convenient, it may be maintained, at least till a thorough and sound system of arranging the *Carenides* into genera shall have been adopted. Its chief noteworthy features seem to be the following :—

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* P.L.S.N.S.W., 1891, vi. (2) p. 431.

Form narrow, cylindric; head large, convex, with a light transverse impression behind, and deep frontal sulci diverging strongly backwards; maxillary palpi triangular, the penultimate joint very short and thick; labial palpi broadly securiform; antennæ sub-moniliform, incrassate; elytra with lateral margin thick, convex, and very narrow behind first ventral segment; the border forming an upturned projection at the shoulders; anterior tibiæ bidentate; anterior femora short, dilatate, channelled on lower side and with a short, deep sinuosity near the apex; intermediate tibiæ with an acute short external tooth at apex.

EUTOMA BIPUNCTATUM.

Carenum bipunctatum, Macl., Trans. Ent. Soc. N.S.W., 1863, i. p. 60; *E. newmani*, Casteln., Trans. Roy. Soc. Victoria, 1868, viii. p. 140; *E. loddonense*, Casteln., l.c. p. 142; *E. punctulatum*, Macl., Proc. Linn. Soc. N.S.W., 1887, ii. (2), p. 130.*

I have already published the opinion that *Eutoma punctulatum*, Macl., = *E. newmani*, Casteln.†; and, having now obtained more specimens of *Eutoma*, must record my conviction that both these names should merge with *E. bipunctatum*, Macl., and further, that a species which is common on the sandhills along the Murray, which seems undoubtedly *E. loddonense*, Casteln., is identical. The localities of my specimens are Coomooboolaroo, near Rockhampton, Q. (Barnard), Castlereagh and Murray Rivers, N.S.W. (Sloane).

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* It is my belief that *E. bipunctatum*, Macl., will be found to be identical with *E. tinctillatum*, Newm., though the evidence in my hands is insufficient to warrant my publishing this as an undoubted fact. Sir William Macleay's species *E. subrugulosum* and *E. substriatulum* seem from description the same species, and identical with the species de Castelnau regarded as *E. tinctillatum*. *E. undulatum*, Macl., (I have a specimen from Yass), must also, I think, be placed under *E. tinctillatum*; also *E. læve*, Casteln., (I have a specimen from Sydney). Slight differences in size and in the amount of the elytra overspread with a blue tinge, cannot be regarded, in themselves, as of sufficient importance to be of specific value, nor is the mere presence of rows of obscure punctures on the elytra enough, in itself, to separate a specimen specifically from others that may have smooth elytra; as these punctures may be produced on naturally smooth Carenides by leaving the specimens in spirits of wine for a time, when fresh. In regard to *E. glaberrimum*, Macl., I have a specimen from the Mudgee district, determined from comparison with the type in the Macleay Collection, which, though apparently somewhat broader, I cannot separate from *E. bipunctatum*, Macl.;—from description *E. mastersi*, Macl., should be the same as my Mudgee specimen.

EUTOMA FRENCHI, n.sp.

Narrow, cylindric, smooth; prothorax with three marginal punctures on each side; elytra quadri-punctate.

Shining metallic green with bluish tints, legs, mesosternum, and metasternum black; the bluish tints more marked on head and prothorax, the under-surface of these rather blue than green. Head large (2·5 × 3 mm.), convex; frontal sulci deep, narrow, long, oblique, converging forwards in a straight course with a short sinuosity in front, their outward course interrupted before the clypeal puncture, very lightly marked between it and anterior margin of head; clypeal puncture strongly impressed; pre-ocular process conspicuous, not divided from the space between the eye and the frontal sulcus; eyes very deeply inclosed in orbits; the post-ocular prominences almost equalling the eyes in size. Prothorax a little longer than broad (3·5 × 3·25 mm.), convex, declivous behind; sides almost parallel before the posterior angles, shortly narrowed behind them; anterior margin truncate, the angles lightly and narrowly advanced; posterior angles rounded; base widely and roundly sub-lobate in middle; a very light sinuosity on each side of the middle part of the base, border narrow, lightly reflexed, everywhere of equal width, without any sinuosity on middle of base; marginal channel very narrow; median line lightly marked; a distinct transverse line defining the basal part; three marginal punctures on each side, as in *Carenum bonellii*, &c. Elytra narrow, subcylindric (7 × 3·5 mm.), very lightly rounded on sides; base truncate, roundly declivous to

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† P.L.S.N.S.W. 1891, vi. (2), p. 431.

peduncle; shoulders hardly marked; border narrow, forming a very faint vertical projection at the shoulders, and a thick rounded edge along the sides, as usual in the genus; each elytron with two strongly impressed punctures on the disc, the anterior placed a little distance from the base, and rather nearer the suture than the margin, the posterior on the apical third, about midway between the suture and the margin; four or five strong punctures on base of each elytron, not placed in a depression near the shoulder; a row of separate ocellate punctures along lateral margins—these more closely placed behind the shoulders; suture strongly impressed. Prosternum hardly impressed between the coxæ. Femora dilatate in middle; anterior very wide, compressed, channelled below; anterior tibiæ bidentate, and otherwise as usual in the genus; intermediate tibiæ wide at apex, with a strong acute spur externally.

Length 13·75, breadth 3·5 mm.

Hab.—North Queensland.

This beautiful species is one of the many novelties sent me by C. French, Esq., who informs me it comes from Queensland, inland from Cooktown. It seems allied to *E. magnificum*, Macl., but is differently coloured both above and below; it must also resemble *E. punctipenne*, Macl., the prothorax of which is described as having "three seta-bearing punctures in each lateral margin," and the elytra as having "four (sometimes five) impressed punctures on each elytron in a line nearer to the lateral margin than to the suture;" yet Sir William Macleay places it in the group with two punctures on the elytra in his list of species in 1887.*

Genus NEOCARENUM.

The following are apparently the most typical features of this genus:—

Form elongate and parallel-sided; antennæ moniliform, lightly incrassate; head with the space between frontal sulci and sides

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* P.L.S. N.S.W., 1887, ii. (2) p. 119.

but lightly convex before the eyes, and crossed by a well-marked pre-ocular sulcus; margin of elytra narrow behind first ventral segment; the humeral projections of the elytral border strong and erect; anterior tibiæ bidentate; the apical plate narrow and projecting downwards at apex in a strong triangular prominence; intermediate tibiæ with a strong external spur at apex.

As points distinguishing it from *Eutoma* the following may be noted :—The spaces between the frontal sulci and the sides of the head (in *Eutoma* roundly convex before the eyes, with the pre-ocular sulcus indistinct across them), the margin of the elytra (in *Eutoma* thick, and forming an evenly rounded *bead* or edge to the elytra), the apical plate of anterior tibiæ (in *Eutoma* broad and obtuse at apex).

I place in *Neocarenum* the two following species, though they are both so extremely isolated that I feel doubtful if I am right in not forming a new genus for each; however, as their affinities are, in a general way, towards *Neocarenum*, and as I am, with my present imperfect knowledge of the tribe, loth to form new genera among the *Carenides*, I prefer to include them in *Neocarenum*, giving descriptions to show their many points of difference from one another and from all other species known to me.

NEOCARENUM ANGUSTATUM, n.sp.

♂. Very elongate, subcylindric; black, smooth; elytra of same width as prothorax, a row of widely-placed strong punctures extending along middle of each elytron from shoulder to apex; anterior tibiæ bidentate.

Head large, convex (4·25 × 5·5 mm.), obsoletely transversely impressed behind; frontal sulci strongly impressed, very divergent backwards, curving sharply out in front in a strongly marked course; pre-ocular sulcus lightly marked, arched; pre-ocular process not prominent; clypeus with a strongly projecting tooth at each side of labrum; the anterior margin trisinuate between these teeth, the sinuosities about equal and forming a well-marked projection on each side of middle one; eyes not prominent; two supra-orbital punctures on each side. Mandibles long and strong. Mentum with lobes long and narrow; median tooth strong, elongate. Palpi with last joint strongly securiform, that of labial very widely so. Antennæ (only seven joints remaining in specimen before me) submoniliform; second joint hardly (if at all) shorter than third. Prothorax a little longer than broad (6·5 × 6 mm.), subcylindric, not declivous behind; sides subparallel, not narrowed in front, lightly and roundly narrowed behind; anterior margin truncate, the angles rectangular; base wide, evenly rounded; border very narrow, not reflexed along sides, except very lightly at the place of the posterior angles, narrower behind these, causing a slight sinuosity before the base, well marked and without any sinuosity on base; marginal channel very narrow and lightly marked; median line strongly impressed, crossed by fine striolæ; a light transverse impression a little before the base; two marginal punctures on each side, the anterior considerably behind the anterior angle; inflexed lateral margin narrow, not projecting from episterna. Elytra elongate (13·5 × 6·25 mm.), subcylindric; the disc a little depressed near suture; sides subparallel, a little narrowed to shoulders, very lightly rounded; apex broadly rounded, obsoletely sinuate on each side near suture, causing the tip of the elytra to project obtusely a little; base broadly emarginate, almost vertical, without punctures; shoulders prominent, with a strong erect conical projection; margin very narrow; border finely reflexed; a row of punctures along margin as in *N. parviceps;* five or six widely-placed, strongly-impressed punctures extending in a row down middle of each elytron from shoulder to apex, the apical two or three of these punctures double; two or three other widely-placed, strong punctures on apical part of each elytron, between the middle row and the margin; suture linear, deeply impressed, inflexed margin very narrow, as in *N. elongatum,* Macl. Prosternum flat between the coxæ, hardly impressed; a lightly marked divergent process on each side of base near peduncle. Anterior femora thick, not channelled below, not greatly arcuate on external side; tibiæ narrow, bidentate, a small external prominence above upper large tooth; inferior ridge with two or three dentiform projections; intermediate tibiæ not very wide, with a strong external apical tooth; posterior legs long and light.

Length 27, breadth 6·25 mm.

Hab.—Nullabar Plains, near Eucla (in the collection of C. French, Esq.).

NEOCARENUM PARVICEPS, n.sp.

♂. Form rather elongate, robust; black, smooth; head small; prothorax depressed, broader than long, rounded on sides, without a border on base; elytra impunctate, narrower than prothorax, narrowed to base.

Head small (3·25 × 4·75 mm.), depressed, lightly transversely impressed behind; frontal sulci very strongly impressed, diverging in a rather sinuous course backwards, curving lightly out in front in a well-marked course; pre-ocular sulcus strongly marked, curving inwards; pre-ocular process prominent, projecting roundly; eyes round, rather prominent, projecting but little beyond the pre-ocular processes; suborbital channel divided by a longitudinal ridge, the lower branch dividing the genæ from the gulæ; three supra-orbital punctures on each side. Mandibles short. Mentum with lobes long, narrow; median tooth strong, pointed, nearly equal to the lobes in length. Palpi with last joint strongly securiform, that of the labial very widely so. Antennæ short, submoniliform; joints 5-11 about equal, short, compressed; apex obtuse; second joint short, not longer than third. Prothorax broader than long (6 × 7 mm.), depressed; sides rounded, widest about middle, roundly narrowed behind; a light short sinuosity near each basal angle behind the lateral border; anterior margin truncate, hardly emarginate; anterior angles broadly rounded, not advanced; posterior angles not marked; base wide, not bordered, rounded in middle, with an obsolete sinuosity towards each side; lateral borders thick, not reflexed, extending round anterior angles, not reaching the base; marginal channel narrow distinct; median line merely forming a faint linear impression on disc; two marginal punctures on each side, the anterior placed in the marginal channel near anterior angles; inflexed lateral margin projecting strongly from the episterna. Elytra subcylindric, not attaining the breadth of the prothorax (12 × 6·75 mm.), impunctate, narrowed at shoulders, widest behind middle, lightly rounded on sides, widely rounded at apex; base subtruncate, a little emarginate between the shoulders, strongly declivous; shoulders prominent, with a strong erect short obtusely conical projection; margin very narrow; border finely reflexed; two or three small punctures on base of each elytron near shoulder; a row of light punctures along lateral margins, more closely placed in front; suture very strongly impressed; inflexed margin acclivous, narrow, but wider than in *N. elongatum*, Macl. Prosternum very lightly and roundly excavate between the coxæ; the posterior margin triangular; a strong divergent process on each side of base near peduncle. Ventral segments rugulose. Legs short: femora short, thick; anterior very lightly channelled below, a light apical sinuosity on their anterior edge; anterior tibiæ short, narrow at base, wide towards apex, bidentate, a very short external tooth a little above the base of upper large one; inferior ridge with three widely separated projections, the two anterior ones dentiform; apical plate narrow, pointed at apex and produced sharply downwards; intermediate tibiæ short, wide towards apex, armed at apex with a long pointed tooth, directed obliquely forwards; posterior coxæ impunctate; posterior trochanters very short, their posterior margin rotundate, their apex forming a little point.

Length 23, breadth 7 mm.

Hab.—Nullabar Plains, Eucla. I am indebted to C. French, Esq., for a specimen, and another is in his collection.

CARENIDIUM SUPERBUM.

Carenum superbum, Casteln., Trans. Roy. Soc. Victoria, 1868, viii. p. 135; *Carenidium kreusleræ*, Macl., Trans. Ent. Soc. N.S.W. 1869, ii. p. 70; *C. lacustre*, Macl., l.c. p. 326.

Since publishing the identity of *Carenidium kreuslerœ*, Macl., with *C. lacustre*, Macl.,* I have seen the type specimen of *Carenum superbum*, Casteln., in the Howitt Collection, and having compared with it a specimen of *C. kreuslerœ*, Macl., am able to state positively that they are one species. It is naturally a smooth species, and the rows of shallow punctures on the elytra, alluded to in de Castelnau's description, have evidently been produced by artificial means.

Genus CONOPTERUM.

This genus was founded by Baron de Chaudoir for a species that he named *C. insigne*, and which must be very nearly allied to, if not identical with, *Conopterum barnardi*, Macl. Unfortunately the Baron omitted to give the size of his species when describing it.

CONOPTERUM RIVERINÆ.

Carenum riverinœ, Macl., Trans. Ent. Soc. N.S.W. 1865, i. p. 181; *Carenum amabile*, Casteln., Trans. Roy. Soc. Victoria, 1868, viii. p. 135.

I have compared a specimen of *C. riverinœ*, Macl., in my collection with de Castelnau's type of *Carenum amabile* in the Howitt Collection, and find them the same species.

C. riverinœ is the only *Conopterum* of which I have collected specimens, viz., two taken last spring about thirty miles south of Narrandera; both were males and had the prominent horn on the left mandible, which is so marked a feature in this genus; another specimen, found dead and broken, is without the mandibular horn, so there seems every probability the late Sir William Macleay was right in his surmise that this is a sexual feature of the male.

Genus TERATIDIUM.

Some time ago I received from Mr. C. French a specimen of this genus as coming from Nicol Bay. It is in a very bad state of preservation, having been picked up dead; the antennæ, palpi, and three of the legs are wanting, and the colour is faded out by the sun. I have been unable to see the description of *T. macros*, Bates, to find if it may be that species. Comparing it with a specimen of *Monocentrum longiceps*, Chaud., an evident affinity is noted; but my specimen of *Teratidium* is too imperfect for any satisfactory notes on their points of resemblance or difference to be made; the *Teratidium* is, however, a much broader insect.

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* Proc. Linn. Soc. N.S.W. 1891, vi. (2), p. 432.

Since my former note on the *Carenides*, and previously to this paper, the following species have been added to the tribe:—

Euryscaphus ebeninus, Sl.; *E. chaudoiri*, Blackb.; *E. sulcicollis*, Blackb.; *Philoscaphus duboulayi*, Blackb.; *Carenum habitans*, Sl; *C. habile*, Sl.; *C. vicinum*, Sl.; *C. ignotum*, Sl.; *C. lepidum*, Sl.; *Trichocarenum elderi*, Blackb.

ADDENDUM.

At p. 26, in my remarks on *Megacephala frenchi*, Sl., I have expressed the opinion that (judging from the description) *M. howitti*, Casteln., would in all probability prove to be synonymous with *M. cylindrica*, Macl. When this was written I had not seen a specimen of *M. howitti;* but having recently seen one of Count de Castelnau's type-specimens in the Howitt Collection at the Melbourne University, I am able to note that it is a very distinct species from *M. cylindrica*, being a much shorter insect with wider and more oval elytra.—T. G. S., *29th Jan., 1894.*

ADDITIONS AND EMENDATIONS TO THE REFERENCE LIST OF THE LAND AND FRESH-WATER MOLLUSCA OF NEW ZEALAND.

By Henry Suter, Christchurch, New Zealand.

(Communicated by C. Hedley, F.L.S.)

(Plates XXII.-XXIII.)

In the above-mentioned list a number of new species were enumerated, the descriptions of which were promised for the next volume of the Proceedings. These are given herewith, accompanied by figures of the shells, and, where it was possible, of the dentition also. There were a few of our shells whose identification seemed to me more or less doubtful, and these I forwarded to the respective museums where the type specimens are preserved, and the gentlemen in charge most obligingly undertook the verification of the specimens, for which kindness my best thanks are due to them. I now wish to place all the reports on record, as they are no doubt of the greatest importance.

Lagochilus Hedleyi, n.sp.

(Pl. XXII. figs. 1-1*d*.)

Shell small, turbinate, perforated, rufous or pale horny, not shining, rather thin, with radiate white membranaceous plaits, which are close together on the penultimate whorl, but are gradually becoming more distant on approaching the aperture, where there are about 9 plaits per millm. Between the plaits the epidermis is faintly spirally striated, crossed by a few growth-lines; the spiral striæ are very close and can only be seen with a good magnifying glass. Spire conical, nearly as high as broad; apex subacute, smooth. Whorls 5, rounded, the first four slowly, the last rapidly increasing. Suture deep; periphery rounded, The notch at the suture is very slight. Aperture nearly circular, diagonal; peristome simple, straight, slightly callous inside, the margins approximating and united by a thin callus. Umbilicus previous, very narrow, deep, open.

Operculum horny, slightly concave, a few whorls only, nucleus central.

Diam., greatest 2, least 1¾; height 2¼ millm.

Animal unknown.

Hab.—North Island: Hillyer's Creek, near Auckland (C. Musson), Hunna Range (Capt. T. Broun), Pirongia Mt. (A. T. Urquhart).

I have much pleasure in uniting the name of my friend Mr. C. Hedley with this species. The two specimens collected by Mr. C. Musson I first took for *L. cytora*, Gray, as they were very much worn and had all the membranaceous plaits rubbed off. In January of last year Capt. T. Broun kindly sent me a number of shells collected by him on the Hunna Range, and amongst them I found two specimens of this new species in good condition.

This species is very near *L. cytora*, Gray, but may be distinguished from it by the membranaceous plaits and the absence of well developed distant spiral striations and epidermal hairs.

LAGOCHILUS TORQUILLUM, n.sp.

(Pl. XXII. figs. 2-2*b*.)

Shell very minute, conical, subperforated, rufous, not shining, very thin and fragile, semi-transparent, with close white membranaceous and oblique radiate plaits, directed slightly backwards; about 15 per millm. on the last whorl. The interstices between the plaits are minutely granulated, the granules sometimes grouped in close spiral striæ on the last whorl. Spire acutely conical, apex rather sharp, smooth. Whorls 5, the last occupying nearly one-half of the height; strongly convex. Suture deep. Aperture diagonal, circular. Peristome simple, straight, the margins not meeting, but united by a thin callus. In this species it can hardly be spoken of a notch in the peristome at the point where the upper margin meets the whorl. Base rounded, the membranaceous plaits extending to the umbilical region, which is slightly deepened. Umbilicus covered.

Operculum lost in all the specimens I have seen.

Diam. 1¼; height 1¾ millm.

Hab.—North Island: Howick and Hunna Range (Capt. T. Broun).

This species, like all the others of the genus, seems to be very rare, but is, from its minuteness and dark colour, easily overlooked.

GUNDLACHIA sp.

In the "Reference List," p. 624, No. 24, it is mentioned that specimens of *Ancylus tasmanicus*, Tenison-Woods, were discovered by me in New Zealand. I wish to point out that I never identified the *Ancylus* I found in the River Avon as *A. tasmanicus*, but as *A. Woodsi*, Johnston (*vide* Journ. de Conch. Vol. xxxii. p. 250). My friend Mr. C. Hedley substituted the former name as a synonym for the latter; but this, I think, is a mistake. There can be no doubt whatever that the Tasmanian *Ancylus Woodsi*, Johnst., is the young form of *Gundlachia Petterdi*, Johnst. Johnston himself says in his description of *A. Woodsi* (Proc. Roy. Soc. Tasm. 1878, p. 25): "Animal and teeth almost similar to *Gundlachia Petterdi.*" And in the description of the latter shell (l.c. p. 23) he writes: "In the young state the shell is simple and resembles the common *Ancylus.*" This explains why Johnston in his List of Tasmanian Mollusca (1890) does not mention his *A. Woodsi*, but unfortunately he also omits to say that it is synonymous with *Gundlachia*. *A. Woodsi* and *Gundlachia* are found in the same localities, a fact which was stated to me by Messrs. Beddome and May. I think that *Ancylus australicus*, Tate, and perhaps *A. Smithi*, Cox, may also be young forms of *Gundlachia*, and it is therefore desirable that their dentition should be examined. I have not seen *Ancylus assimilis*, Pett., and *oblonga*, Pett., but *A. tasmanicus*, Tenison-Woods, I take to be a true *Ancylus*, and not a young *Gundlachia*.

Some time ago I found a great number of the so-called *Anclyus Woodsi*, Johnst., in the River Avon, and this time alive. On examining the radula and comparing it with that of a *Gundlachia* from Ohio, U.S.A., I found that our mollusc is also a *Gundlachia.* This was fully confirmed by finding a number of shells in which the *septum* had begun to form or was already completely formed, and I hope to find full-grown *Gundlachia* later on. Prof. F. W. Hutton suggested to me that this *Gundlachia* might have been introduced from Tasmania on aquatic plants used for packing trout ova. This question can of course only be settled definitely when *Gundlachia* is found in other localities, where the introduction is out of question. There is, however, one reason which leads me to think that this *Gundlachia* is really a New Zealand mollusc. I found the shells up to the present time only at the end of the outflow of Horse-Shoe Lake in the River Avon, and from this place *further down* for about a mile on the same bank of the river. I have not found *Gundlachia* from the outflow of the lake *upwards* to the fish-hatching establishment, which is distant several miles. This makes it very probable that the original habitat of our shell is the Horse-Shoe Lake, and that it was brought down to the river when the canal from the lake was cleared from aquatic plants *(Anacharis).* The lake is very difficult of access, and that is why I have not explored it yet. It seems to me that *Gundlachia* wants for its full development a still water, and that in the river the animals, at least most of them, continue living in an *Ancylus*-shell and dying without ever having made an attempt to build the peculiar shell of *Gundlachia.* Therefore we find here as well as in Tasmania rather large ancyliform shells of this *Gundlachia*, whilst the shells with a septum are of much smaller size. In Tasmania *A. Woodsi* is said to be plentiful and *Gundlachia* very rare in the same locality.

PARYPHANTA MEESONI, Suter, sp.

No. 52 of the Reference List. It is not so very long ago that I ascertained the fact that this species lays calcareous eggs and can therefore not belong to the genus *Rhytida*, where I first placed it, as this genus is said to be viviparous. In the exterior of the animals of *Paryphanta* and *Rhytida* there is hardly any difference, and the shell characters of *P. Meesoni*, the smallest known of the genus, are as well with *Rhytida* as with *Paryphanta*. It is remarkable for the absence of a thick epidermis involving the peristome.

THALASSOHELIX ZICZAC, Gould, sp.

I am glad to say that I was perfectly right in admitting *T. ziczac*, Gould, and *T. portia*, Gray, to be one and the same species. I sent a specimen to Dr. W. H. Dall in Washington to have it compared with Gould's *ziczac* and he kindly wrote to me that there is no doubt whatever of the identity of my specimen with *Helix ziczac*, Gould. A similar specimen was sent to Mr. E. A. Smith of the British Museum and this gentleman most obligingly informed me that it perfectly corresponds with Gray's *Helix portia*.

THALASSOHELIX ZELANDIÆ, Gray, sp.

A specimen of this shell from Auckland was also forwarded to the British Museum for comparison with Gray's type. I am indebted to Mr. E. A. Smith for the following report: "The shell under this name is, I think, a form of that species. It is larger than any of our typical examples and more brightly variegated, and the whorls are perhaps a trifle flatter ; still I think it is only a variety."

ALLODISCUS WAIROAENSIS, n.sp.

(Pl. XXII. figs. 3-3*b*.)

Shell small, discoidal, perforated; colour pale horny with radiate streaks of rufous on the surface, tessellated on the periphery, minutely spotted on the base; not shining, thin, semi-transparent, with fine and narrow radiate ribs, which are almost straight on the surface, slightly sinuated at the side and straight again on the base, extending to the umbilicus. Ribs about 7 per millm. Spire very short, flat. Whorls 4½, rounded, slowly and regularly increasing. Apex blunt, smooth. Suture impressed, the last whorl not descending. Aperture slightly oblique, lunar, rather considerably excavated by the penultimate volution. Peristome straight, acute, margins very little approximating. Columellar margin short, oblique, slightly thickened and reflexed. Base convex, with a thin white callosity to a short distance outside the aperture. Umbilicus very narrow, open, deep.

Diam., greatest $3\frac{1}{4}$, least $2\frac{3}{4}$; height 2 millm.

Animal unknown.

Hab.—Wairoa Gorge, near Nelson.

This species is nearest to *A. venulatus*, Pfeiffer, but is distinguished from it by being smaller, perforated, and the ribs more distant.

Allodiscus Urquharti, n.sp.

(Pl. xxii. figs. 4-4*d*.)

Shell very minute, globosely depressed, umbilicated; colour horny without any markings, silky, thin, and fragile, transparent, with extremely fine and close set radiate ribs, which are slightly directed forwards and reach to the umbilicus; ribs about 40 per millm. Spire short, convex. Apex blunt, smooth. Whorls $3\frac{1}{2}$, narrow, slowly and regularly increasing, rounded, the last not descending. Suture deep; periphery rounded. Aperture nearly vertical, rotundly lunate, much excavated by the penultimate whorl. Peristome simple, straight, acute, columellar margin regularly arched, not reflexed; margins convergent. Base rounded. Umbilicus narrow, previous deep.

Diam., greatest $1\frac{1}{2}$, least $1\frac{1}{4}$; height 1 millm.

Hab.—North Island: Pirongia Mt. (A. T. Urquhart), Hunna Range (Capt. T. Broun).

I have much pleasure in naming this rare species after Mr. A. T. Urquhart, who first discovered it.

A. Urquharti is the minutest, widest umbilicated, and closest ribbed known species of the section *Allodiscus*.

Jaw (fig. 4*c*) arcuate, consisting of about 14 thin plaits, indenting both margins. The central plaits are broader than those on the ends, and are separated from each other by a narrow interstice.

Radula (fig. 4*d*) tongue-shaped, transverse rows straight, consisting of 18—1—18 teeth, of which 3 to 4 may be considered as laterals. Central tooth small, base longer than broad, narrow and rounded anteriorly, broader and almost straight on the posterior end. Reflection small, rounded, with one sharp median cutting point, extending very little beyond the middle of the base. Lateral teeth broader, quadrate, reflection broad, short, bicuspid, with one short cutting point on each cusp, not reaching the posterior margin of the base.

There follow a few transition teeth, going over from bicuspid to tri- and quadricuspid marginals, which are much broader than long, the cutting points rather long and sharp. The second cutting point is the longest. Last marginal with three cutting points only.

THERASIA TRAVERSI, E. A. Smith, sp.

(Pl. XXII. figs. 5-5*a*.)

This shell was classed by its author under *Thalassia*, but on examining the radula of the animal I at once saw that it really belongs to the section *Therasia*, Hutton. As first pointed out by Prof. F. W. Hutton, the shells in both sections, *Thalassohelix* and *Therasia*, show almost the same characters, and it is therefore necessary to examine the radula for ascertaining the respective section. The dentition of *T. Traversi* having never been examined before, I propose to give description and figures of it.

Jaw (fig. 5) slightly arcuate, membranaceous, the ends bent upwards. It is composed of numerous narrow nearly vertical plaits, partly overlying each other, broadly indenting the upper margin.

Radula (fig. 5*a*) tongue-shaped, the straight transverse rows consisting of 34—1—34 teeth, of which 14 are laterals. Central tooth quadrangular, somewhat longer than broad, with a triangular reflection, bearing one short median cutting point, which does not extend to the posterior end of the base. Laterals slightly broader, bicuspid, the inner cusp much broader and longer than the anterior one, each of them being provided with a cutting point, which shows a development corresponding to the reflection, but neither of them reaches to the posterior end of the base.

A number of intermediate teeth are following, in which the base is getting broader and shorter, the two cutting points stouter and longer, extending beyond the base. Marginals short and broad, provided with two well developed inner cutting points, the outer posterior margin of the base bearing three to four small teeth or being simply indented. Last marginals rudimentary, quadrate, minute.

FLAMMULINA CREBRIFLAMMIS, Pfeiffer, sp.

In "Nautilus," vii. July, 1893, No. 3, p. 35, Mr. C. Hedley published the following note:—"In the Reference List *Flammulina infundibulum*, H. and J., was placed under *F. crebriflammis*, Pfr., as a synonym. Tryon and Pfeiffer, whom we followed in this course, were certainly wrong in connecting *infundibulum* with *crebriflammis* (Mon. Hel. Viv. iii. p. 148, etc.). *H. infundibulum* was described from Vavas, Tonga I., and appears to be a small variety of *gradata*, Gould. It was omitted from Mousson's Tongan list."

LAOMA PIRONGIAENSIS, n.sp.

(Pl. XXII. figs. 6-6*b*.)

Shell small, conoidal, perforated; colour horny, banded with rufous, in zigzag lines on the last whorl and extending to the umbilicus; not shining, semitransparent, with oblique slightly membranaceous plaits, about 7 per millm., crossed by exceedingly fine and narrow spiral striæ, which become more distinct at the base. Spire conoidal, rather obtuse; apex smooth. Whorls 5½, slowly and regularly increasing, rather flattened, the last subangulated. Suture not deep and not margined. Aperture oblique, lunate; peristome thin, straight. There are four lamellæ in the aperture: at the base of the columella is an acute plait, two lamellæ are situated on the penultimate whorl, the lamella on the inner side being considerably stouter and longer than the outer one, and a small tooth is fixed at the basal lip near the outer lip. Columellar margin ascending, slightly reflexed ; basal margin somewhat callous. Umbilicus very narrow, deep.

Diam. 2 ; height 1·9 millm.

Animal unknown.

Hab.—North Island : Pirongia Mt., Waikato district (A. T. Urquhart).

This species seems to be very rare, as two specimens only were obtained. It may be placed between *L. poecilosticta* and *L. marina.*

ENDODONTA TIMANDRA, Hutton, sp. 1883.

In the Reference List, p. 651, I placed this species under *E. varicosa,* Pfr., as a synonym, which, as the following report of Mr. Edg. A. Smith, of the British Museum, will show, was wrong. I sent two specimons of *E. timandra,* Hutton, for comparison with Pfeiffer's type of *varicosa,* and I am obliged to Mr. Edg. A. Smith for the following information :—"*E. timandra* is distinct from *varicosa,* Pfr. It is smaller, more openly umbilicated, has more riblets, and the armature of the mouth is different. There are three teeth in *timandra* and *one* (overlooked by Pfeiffer and Reeve) in *varicosa,* situated on the body-whorl. It is a very slender lamella and might easily be overlooked."

The reference for *E. timandra* is as follows :

Syn.—*varicosa,* Suter *(non* Pfeiffer, 1852).

Illustr.—Man. Conch. (2) viii., pl. xxiv., figs. 21-23.

Descript.—Hutton, N. Zeal. Jour. of Science, 1883, p. 475 ; Trans. N. Zeal. Inst. Vol. xvi. pp. 175, 192 ; Man. Conch. (2), viii. p. 84.

Hab.—North Island: Auckland (Cheeseman), Thames, Whangarei, Mt. Wellington, Hunna Range, Pirongia Mt., Hawke's Bay, Forty Mile Bush, Wellington.

Note.—This species seems to be limited to the North Island. I have not seen it from any other part of the colony.

ENDODONTA VARICOSA, Pfeiffer, sp. 1852.

(Pl. XXII. fig. 7).

The correct reference of this species is now the following:—

Syn.—*timandra*, Suter (*non* Hutton, 1883).

Illustr.—Reeve, Conch. Icon. vii. pl. CXXXIII. fig. 824; Tryon, Struct. Syst. Conch. iii. pl. XCIV. fig. 12; Man. Conch. (2), iii. pl. III. fig. 10.

Descript.—Pfeiffer, P.Z.S. 1852, p. 148; Mon. Hel. Viv. Vol. iii. p. 97; Reeve, Conch. Icon. Helix, p. 824; Hector, Cat. Land Moll. N. Zeal. 1873, p. 11; Hutton, Man. N. Zeal. Mollusca, 1880, p. 70; Trans. N. Zeal. Inst. Vol. XVI. p. 192; Man. Conch. (2) iii. p. 23.

Dentition.—Suter, Trans. N. Zeal. Inst. Vol. XXIV. p. 293, pl. XXII. figs. 28, 29 (this radula is abnormal).

Hab.—South Island: Akaroa (Suter), Dyer's Pass, Riccarton Bush, near Christchurch.

Note.—This species replaces *E. timandra* in the South Island. I have not seen it from the North Island.

As mentioned above the radula described and figured in Trans. N. Zeal. Inst. XXIV. shows quite exceptional abnormal forms of the rachidian and lateral teeth, but it is from *E. varicosa* and not *timandra*, Hutt. I fortunately received a living specimen from Bank's Peninsula, which proved to possess a normal radula, and I wish to give here a short description of it, accompanied by a figure.

Radula (fig. 7) tongue-shaped, with transverse straight rows of teeth 13—1—13, of which three may be considered as laterals, and three as transition teeth. The central and laterals are very much alike, the base quadrangular, slightly longer than broad, sinuated in front. Reflection tricuspid, the median cusp with its short cutting point reaching to the posterior end of the base; the side-cusps are short, rounded, each with a very small cutting point. In the lateral teeth the median cutting point extends beyond the base. The intermediate teeth show a stronger development of the inner side and median cutting point, the reflection is getting broader and longer, and in the marginal teeth we find a broad, more or less quadrangular reflection with three or four cutting points, the two inner ones much longer than the others. The last but one is bidentate, the last minute, without cutting point. The other radula I described had the formula 15—1—15.

PTYCHODON HUNNAENSIS, n.sp.

(Pl. XXIII. figs. 8-8*c*.)

Shell minute, sub-discoidal, umbilicated, pale horny, with distant irregular broad streaks of rufous; not shining, thin and fragile, semi-transparent. Whorls 5, narrow, regularly increasing, slightly rounded, the last proceeding considerably below the penultimate; with radiate, fine, nearly straight ribs, about 15 per millm., slightly directed forwards. Spire short, almost flat. Apex blunt, smooth. Suture impressed; periphery rounded. Aperture rotundly-lunar, oblique, excavated by the penultimate whorl in the upper part. Peristome straight, acute, margins convergent, regularly arched, columellar margin descending obliquely, not reflexed. Aperture with 12 teeth, three on the penultimate whorl, two on the columella, and seven on the parietal wall. On the penultimate whorl is centrally situated a stout lamina, forked at the top by a broad groove, and below it are two acute laminæ at regular intervals of one-third. From the columella two large blunt teeth, on a common base, extend rather far into the aperture. The parietal wall is covered with seven somewhat irregular and rather blunt teeth. Umbilicus broad, perspective, occupying nearly one-third of the diameter. Base rounded.

Diam., 2; height 1 millm.

Hab.—North Island: Hunna Range (Capt. T. Broun), Taupiri Mt. (A. T. Urquhart), Waimarama, Hawke's Bay (A. Hamilton).

A single specimen only from each locality.

CHAROPA PSEUDOCOMA, n.sp.

(Pl. XXIII. figs. 9-9*e*.)

Shell discoidal, umbilicated, fuscous with a greenish hue, sometimes with distant, irregular, radiate brown streaks, which extend in zigzag lines to the umbilicus, sometimes without distinct marks; not shining, thin, semi-transparent, with oblique slightly curved close ribs, slightly directed backwards, about 5 per millm.; the interstices between the ribs occupied by fine growth-lines. Spire flat, periphery rounded, apex smooth, mostly devoid of epidermis and somewhat eroded. Whorls 5, rather flattened, especially the four first ones, slowly and regularly increasing, the last not descending anteriorly; suture not deep. Aperture diagonal, lunately-rotund; peristome simple, straight, acute, margins slightly convergent; columellar margin arched, slightly dilated above towards the umbilicus, which is broad, conical, showing all the volutions and occupying over four-tenths of the diameter; base rounded.

Diam., greatest 5½, least 5; height 2½ millm.

Hab.—South Island: Akaroa, Port Hills (Lyttelton), Dyer's Pass, Riccarton Bush, near Christchurch (H. S.) In these places it seems to replace *Ch. coma*, Gray.

Note.—This species, which is very near *Ch. coma*, is distinguished from it by its smaller size, the darker colour and its greenish hue, the very frequent absence of any markings, and, if present, their zigzag form on the base. The ribs are closer and finer, the spire always flat, and the umbilicus broader. It is much more constant in form than *Ch. coma*.

Animal very shy, small, yellowish-white. Eye-peduncles rather large, clavate, blackish, from each of them a black stripe runs along the neck to the mantle. Tentacles short, rather stout, rounded in front. The neck is transversely grooved. The whole length of the foot is bordered by a distinct pedal line, and to it run over the entire length of the body diagonal grooves. Mantle rather posterior; tail short, rounded, tapering, without mucous pore, not extending beyond the shell. Sole uniformly coloured, whitish and smooth.

Jaw very thin, membranaceous; the upper margin arcuate, the cutting edge indistinct, almost straight, running over into the membrane to which jaw and radula are attached.

Radula tongue-shaped, the transverse straight rows consisting of 16—1—16 teeth, of which 4 to 5 may be considered as laterals. In another radula the formula was 15—1—15. Central tooth quadrangular, longer than broad, sinuated anteriorly, reflection tricuspid, the median long and reaching with its short cutting point to the posterior end of the base; the side-reflections are short, rounded, each with a rudimentary cutting point. Laterals broader, almost quadrate, similar to the rachidian tooth, but the median cutting point is extending beyond the base over the next row of teeth. A few intermediate teeth show a shortening of the median reflection, its cutting point growing stouter and longer, and the cutting point on the inner side is also increasing in size.

Marginals short and very broad, first with three, then with four teeth, of which the two inner ones are long and stout, the outer ones remaining small. Last marginal minute, quadrate, with two teeth.

CHAROPA SEGREGATA, n.sp.

(Pl. XXIII. figs. 10-10*b*.)

Shell small, discoidal, umbilicated, not shining, colour horny with distant, irregular light-brown radiate streaks; thin, semi-transparent; rather distantly ribbed, the ribs almost straight, extending to the umbilicus; about 5 per millm., interstices with numerous very fine growth-lines. Spire flat, apex smooth, somewhat shining, white. Whorls 5, slowly and regularly increasing, rounded, the last not descending in front; suture impressed, periphery rounded. Aperture slightly oblique, rotundly-lunar, but little excavated by the penultimate volution. Peristome simple, acute, straight; columellar margin arcuated, not reflexed, margins slightly converging. Umbilicus broad, conical, about one-third of the diameter; base rounded.

Diam., greatest $2\frac{3}{4}$, least $2\frac{1}{2}$; height $1\frac{1}{4}$ millm.

Hab.—North Island. Collected amongst a lot of other shells from flood margin of a stream at Waimarama, Hawke's Bay, by Mr. A. Hamilton.

Animal unknown.

This shell stands nearest to *Ch. anguiculus*, Reeve.

CHAROPA BUCCINELLA, Reeve, sp., 1852.

Syn.—*gamma*, Pfeiffer, 1852 (? 1853); *sylvia*, Hutton, 1883; *tau*, Suter (*non* Pfeiffer, 1862).

Illustr.—Reeve, Conch. Icon. vii. pl. CXXXIII. fig. 821; Man. Conch. (2), iii. pl. III. fig. 11.

Descript.—Reeve, Conch. Icon. *Helix* sp. 821; Pfeiffer, P.Z.S. 1852, p. 57; Mon. Hel. Viv. Vol. iii. p. 100; Hector, Cat. Land Moll. N.Z. 1873, p. 13; Hutton, Man. N.Z. Moll. 1880, p. 8; and N.Z. Journ. of Science, 1883, p. 476; Trans. N.Z. Inst. xvi. pp. 175, 193; Man. Conch. (2), Vol. viii. p. 98.

Dentition.—Suter, Trans. N.Z. Inst. xxiv. p. 293; pl. XXI. figs. 24-25.

Hab.—North Island: Auckland, Horokiroi, Forty Mile Bush, Howick, Whangarei, Mt. Wellington, Hillyer's Creek, Auckland, Hunna Range, Pirongia Mt., Hawke's Bay. South Island: Bealey, Riccarton Bush, near Christchurch.

Note.—*Charopa sylvia*, Hutton, is not synonymous with *Ch. tau*, Pfeiffer, as suggested by me in P.L.S.N.S.W. (2), vii. p. 657. I sent specimens of *Ch. sylvia* to Mr. Edg. A. Smith, Brit. Mus., for examination, and he kindly sent me the following information:—"*Ch. sylvia*, Hutton. You question this being the same as *tau*, Pfeiffer. We have not yet the latter in the Museum, but Pfeiffer's description 'subdistantem costata-plicata' scarcely applies to your specimens. They are undoubtedly identical with Pfeiffer's *gamma*. I have compared them with the types, and they agree in every respect, excepting that yours are fresher."

CHAROPA BUCCINELLA, Reeve, var. SERPENTINULA, Suter, 1891.

Mr. Edg. A. Smith, Brit. Mus., to whom I sent specimens of my *Ch. serpentinula*, writes that he cannot separate the latter from *Ch. buccinella*, Reeve. There is no doubt that both species are closely allied, but they are distinct. I compared fresh and good specimens of both, and the result of my investigation is as follows:—In *buccinella* the inner volutions are slightly elevated above the last, whilst in *serpentinula* the surface is perfectly flat. In the former the riblets are stronger and sharper and considerably more directed forwards; there are about 9 per millm., whilst in *serpentinula* they nümber about 15 per millm. The growth-lines of the interstices are distinctly *reticulated* in *buccinella*, but simple in *serpentinula*. The light-brown colour markings on the latter generally form zigzag lines on the periphery and base, but *buccinella* is mostly tessellated, horny and chestnut. In *buccinella* the last whorl is more tapering and the umbilicus slightly narrower than in *serpentinula*. In both the apex is radiately striated. In the dentition there is no great difference.

I am of opinion that *Ch. serpentinula* should be considered as a *variety* of *Ch. buccinella*.

CHAROPA ANGUICULUS, Reeve, var. MONTIVAGA, n.var.

(Pl. XXIII. figs. 11-11*b*.)

[=*buccinella*, Hutton, Suter, *non* Reeve.

Shell subdiscoidal, umbilicated, horny or light brown, with radiate irregular broad streaks of fulvous or chestnut; faintly shining, thin and semitransparent; closely arcuately longitudinally ribbed, riblets 10-11 per millm., interstices with fine growth-lines. Whorls 5, slowly and regularly increasing, rounded; suture impressed; periphery rounded; the last whorl not descending in front. Spire almost flat. Embryonic whorl smooth. Aperture diagonal, rounded. Peristome acute, straight, regularly rounded, columellar margin not deflexed, margins approximating. Umbilicus broad, perspective, occupying nearly four-tenths of the diameter. Base rounded.

Diam., greatest $3\frac{3}{4}$, least $3\frac{1}{2}$; height $1\frac{3}{4}$ millm.

A short diagnosis is also given in Trans. N.Z. Inst. Vol. xvi. p. 192 (*P. buccinella*).

Dentition.—Hutton, Trans. N.Z. Inst. Vol. xvi. p. 163, pl. IX. fig. D.

Hab.—North Island: Auckland (Gillies), Hunna Range, Thames, Ohaupo, Hawke's Bay, Pirongia Mt., Forty Mile Bush. South Island: Dunedin, Greymouth, Oxford, Hooker Valley.

Note.—Specimens of this shell, which by Prof. Hutton and myself were considered to be *Ch. buccinella*, Reeve, were sent to Mr. Edg. A. Smith, of the Brit. Mus., for comparison with Pfeiffer's types. Under date 21st Aug., '93, he very kindly informs me that he cannot identify these shells with anything in the Brit. Mus. collection, and there can be no doubt that they have never been described before.

This shell is very variable with regard to the intensity of the colouring, and adult specimens are rare.

CHAROPA TAU, Pfeiffer, sp., 1862.

Syn.—*mutabilis*, Suter, 1891, = *sylvia*, Suter (*non* Hutton).

Illustr.—Trans. N.Z. Inst. Vol. xxiii. pl. XVI. figs. 2-2*b.*; Man. Conch. (2), viii. pl. XIX. figs. 25-27.

Descript.—Mal. Blät, viii. p. 148; Pfeiffer, Mon. Hel. Viv. Vol. v. p. 159; Hector, Cat. Land Moll. N.Z. p. 12; Hutton, Man. N.Z. Moll. p. 8; Trans. N.Z. Inst. Vol. xxiii. p. 84; Man. Conch. (2), Vol. viii. pp. 98, 101.

Dentition.—Trans. N.Z. Inst. Vol. xxiii. p. 85, pl. XVI. figs. B. C.

Hab.—South Island: Hooker Valley, Castle Rock, Southland, Mt. Somers.

Note.—As *Ch. sylvia*, Hutton, is not identical with *Ch. tau*, Pfeiffer, but with *buccinella*, Reeve, I came to the conclusion that my *Ch. mutabilis* must be the same as Pfeiffer's *Ch. tau.* I compared my specimens with the description given by Pfeiffer, and they agree in every respect. The only difference is in the height of the shell. Pfeiffer gives it to one millimetre, whilst all my specimens show 1½, or but very little less.

ARIOPHANTA NOVARÆ, Pfeiffer, sp., 1862.

This species was classed under *Flammulina* in the "Reference List" (p. 644). On carefully examining jaw and radula I saw, however, that it is in fact an *Ariophanta* (*Nanina*, Gray, *non* Risso). The dentition will be described and figured in Vol. xxvi. o the Trans. N.Z. Inst.

FRESHWATER SHELLS ERRONEOUSLY ASCRIBED TO NEW ZEALAND.

(1) *Melanopsis wagneri*, Roth, is mentioned as having been found in Lake Rotoiti, which of course is quite wrong, as this species, according to Mr. Hedley's kind information, is a synonym of *M. praerosa*, Linné, ranging from Syria, the Greek Islands, and Algeria to Morocco.

(2) *Ancylus dohrnianus*, Clessin, resembles somewhat *A. irvinae*, Petterd, from Tasmania, but the apex is quite different. Neither Prof. Hutton nor the writer has any knowledge of an Ancylus ever having been found in this colony (*Ancylus woodsi*, Johnston, being a *Gundlachia*), and Clessin's species may therefore help to swell the already long list of shells erroneously ascribed to New Zealand.

INTRODUCED LAND SHELLS OF NEW ZEALAND.

(1) *Vallonia pulchella*, Mueller, was found by Mr. Cheeseman in Albert Park, Auckland.

(2) *Cochlostyla fulgetrum*, Broderip (= *Bulimus antipodarum*, Gray, 1843). *B. antipodarum* is said to have been found at Kaitaia by Dieffenbach, and recent collectors (Gillies, T. W. Kirk) are reported as having found this shell at different places in the northern part of the province of Auckland. Opinions are divided as to the validity of the species; some consider it as the young of *Placostylus bovinus*, others take it as a good species. I therefore thought it well worth to investigate the question. Looking at the figure of *Bul. antipodarum* given by Edg. A. Smith (Voy. Erebus and Terror, II. Moll. pl. I. fig. 5), and reading Gray's description one must come to the conclusion that this shell cannot belong to the genus *Placostylus*, the aperture being quite

different, but it agrees in every respect with *Cochlostyla*. This opinion was evidently shared also by the author of the species, for he says that it is allied to *Bulimus fulgetrum*, Broderip, from the Philippine Islands, which is a true *Cochlostyla*. Reading Gillies' remarks on *B. antipodarum* (Trans. N. Zeal. Inst. Vol. i. p. 60), it gives one the impression that he mistook young specimens of *P. bovinus* for Gray's species, and in this he was followed by others. Prof. Hutton kindly allowed me to examine specimens in the Canterbury Museum, labelled *B. antipodarum*, Gray, and they proved to be young specimens of *P. bovinus*, but were in no way related to *B. antipodarum*.

I am now of opinion that the shell found by Dieffenbach and described by Gray as *Bulimus antipodarum* has very likely never been found again in New Zealand, and is in reality *Cochlostyla fulgetrum*, Broderip, introduced accidentally from the Philippine Islands. This suggestion is supported by the fact that *Cochlostyla daphnis*, Broderip, another species from the Philippine Islands has been found at Picton (Trans. N. Zeal. Inst. Vol. xxiv. p. 280).

EXPLANATION OF PLATES.

PLATE XXII.

Figs. 1-1*b*.—*Lagochilus Hedleyi*, Sut., shell (× 6).
Fig. 1*c*. —*Lagochilus Hedleyi*, Sut., operculum.
Fig. 1*d*. —*Lagochilus Hedleyi*, Sut., part of last whorl, greatly magnified.
Figs. 2-2*a*.—*Lagochilus torquillum*, Sut., shell (× 6).
Fig. 2*b*. —*Lagochilus torquillum*, Sut., part of last whorl, greatly magnified.
Figs. 3-3*b*.—*Allodiscus wairoaensis*, Sut., shell (× 3).
Figs. 4-4*b*.—*Allodiscus Urquharti*, Sut., shell (× 6).
Fig. 4*c*. —*Allodiscus Urquharti*, Sut., jaw, magnified.
Fig. 4*d*. —*Allodiscus Urquharti*, Sut., teeth of radula, magnified.
Fig. 5. —*Therasia Traversi*, E. A. Smith, jaw, magnified.
Fig. 5*a*. —*Therasia Traversi*, E. A. Smith, teeth of radula, magnified.
Figs. 6-6*b*.—*Laoma pirongiaensis*, Sut., shell (× 10).
Fig. 7. —*Endodonta varicosa*, Pf., teeth of radula, magnified.

PLATE XXIII.

Figs. 8-8*b*.	—*Ptychodon hunnaensis*, Sut., shell (× 10).
Fig. 8*c*.	—*Ptychodon hunnaensis*, Sut., aperture of shell, greatly magnified.
Figs. 9-9*b*.	—*Charopa pseudocoma*, Sut., shell (× 4).
Fig. 9*c*.	—*Charopa pseudocoma*, Sut., animal (× 2).
Fig. 9*d*.	—*Charopa pseudocoma*, Sut., jaw, magnified.
Fig. 9*e*.	—*Charopa pseudocoma*, Sut., teeth of radula, magnified.
Figs. 10-10*b*.	—*Charopa segregata*, Sut., shell (× 6).
Figs. 11-11*b*.	—*Charopa anguiculus*, Reeve, var. *montivaga*, Suter, shell (× 5).

NOTES TO THE ABOVE, BY C. HEDLEY.

In detailing the catalogues relating to the Land and Freshwater Shells of New Zealand, there was omitted on p. 614 mention of Hutton's "List of the Freshwater Shells of New Zealand" P.L.S.N.S.W. (1) vii. pp. 67-68. Another list, then unknown to me, by Ancey, enumerating and classifying the Helicoids of New Caledonia, Bull. Soc. Mal. France, v. p. 357, should have been named on p. 616.

Mr. Pilsbry informs me that *Realia* appeared in the Synop. Contents B. M. 1840, p. 153, without any sort of description. The name should, therefore, date from 1850.

With reference to sp. 23, I note that Gould himself says, Otia Conchologica, p. 224, of his own species, *lateralis*, that it "is *L. neritoides*, Gray, probably."

E. R. S [ykes] writes (Conchologist, Sept., 1893, Vol. ii. p. 180): "The Zoological Society informs me that the part in which Pfeiffer's original description appeared was issued in March or April, 1854, though bearing the date 1852. There is, therefore, no question as to priority, and Pfeiffer's names must be given up for Reeve's." Therefore, as I conjectured, the names Pfeiffer attached to species 54, 59, 62, 65, 66, 72, 90, 94, 96, 99, 108, 111, 117, 131, 145, 147, 158, 164, 166, 167, 168 and 169 first appeared in the Monographia Heliceorum Viventium, Vol. iii., and should be dated 1853, the date of that Volume.

Ancey claims (Bull. Soc. Malac. France, v. Mars, 1889, p. 370) the genus *Psyra* (=*Allodiscus*, p. 638) as synonymous with his *Monomphalus* (described in Le Naturaliste, 1882, p. 86). He also (op. cit. p. 371) includes in *Rhytidopsis* (Le Naturaliste, 1882, p. 85) *pilula* and *granum*, the species constituting Suter's genus *Phenacohelix*. Ancey's *Ptychodon* dates from 1888 (Bull. Soc. Malac. France, v. p. 373), not from 1891 as misquoted on our p. 652.

C. P. Gloyne asserts (Quart. Journ. Conch. I. Feb., 1878, p. 319) that "Smith's name *kermadeensis* has priority over Prof. Mousson's *ultima*."

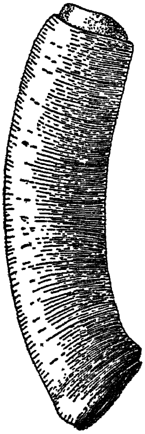
For an account of the anatomy of *P. hochstetteri*, see "On the genus *Paryphanta*," by Lieut.-Col. Godwin-Austen. Proc. Malac. Soc. I. pp. 5-9, pl. I.

DESCRIPTION OF *CÆCUM AMPUTATUM*, AN UNDESCRIBED MOLLUSC FROM SYDNEY HARBOUR.

BY C. HEDLEY, F.L.S.

(Communicated by permission of the Trustees of the Australian Museum.)

Shell smooth, glossy, opaque, white, short, subcylindrical, slightly bent, near the aperture inflated, then constricted. Lip sharp and everted. Surface microscopically transversely scratched. Mucronal septa well exserted, surrounded by a crown of the truncated tube, apex placed on the side of convex curvature. Length 2, breadth ½ mm.



Hab.—In shell-sand, Cabbage Tree Bay, near Manly, N.S.W. *(Brazier)*; Long Bay, near Sydney *(Quaife)*.

Type in the Australian Museum.

According to the arrangement followed in Tryon's Monograph of this genus, this species would fall into the section "*Levia.*" The short straighter form of the new species distinguishes it readily from all there enumerated except from the Mediterranean shell *C. auriculatum*, de Folin, in which a rib is represented surrounding the aperture quite unlike what prevails in *C. amputatum*.

The only other Australian species known are those collected by the "Challenger" in Torres Straits.

ON THE AUSTRALASIAN *GUNDLACHIA.*

By C. Hedley, F.L.S.

(Plate xxiv.)

The eccentric shell of *Gundlachia*, one part shaped like a knife-sheath, or rather a spectacle-case, plastered askew upon another part like the shell of an ordinary fresh-water limpet, the creature's external likeness and internal unlikeness to *Ancylus*, and the remarkable, discontinuous, geographical distribution of the genus, combine to tempt a naturalist's curiosity. For a chance to satisfy such curiosity I am indebted to several friends who have liberally assisted me with all the material and information at their command, and without whose kindly aid I should have had to relinquish, unprofited, the study of the subject. Prof. Tate has kindly loaned me the actual types of *G. petterdi* and given me examples of that species collected by himself at Mt. Lofty near Adelaide, S. Australia. Mr. W. F. Petterd has liberally communicated a large series of *Gundlachia*, including the actual type of his species *G. beddomei.* Mr. C. E. Beddome has supplied me with a collection of *Gundlachia* from various localities. Mr. H. Suter has convinced me of the method by which the primary shell is transformed into the adult by presenting me with a series showing the passage from stage to stage collected by him in New Zealand. To Mr. R. H. Pulleine, of the Adelaide University, who guided me to the spot and procured me several specimens, I am particularly obliged for the pleasure of viewing *Gundlachia* alive at Henley Beach near Adelaide.

The genus *Gundlachia* was instituted by Pfeiffer in the Zeits. Malak. vii. 1849, p. 98, for the reception of immature specimens of *G. ancyliformis*, Pfr., sent to him by his correspondent Dr. J. Gundlach from Cardenas in Cuba. Troschel supplemented his friend's description by an account of an animal which had dried in the shell. From the dentition he classed the puzzle, not, as Pfeiffer was inclined to do, with *Navicella* and *Neritina*, but with its real kin the Lymnaeidæ. Though not recognising it as such, he distinguished the jaw as a brown semitransparent arch, convex in front and extending from eye to eye. Further remittances from Gundlach enabled Pfeiffer to describe and figure (*op. cit.* 1852, p. 180, pl. I. ff. 1-16) the adult and immature shells and to add some information from the collector of its habits and appearance when alive. From this species Bourguignat carved (Spicil. Malac. 1862, pp. 82-87) a new genus, *Poeyia*, type *P. gundlachioides*, and two other species, *G. adelosia* and *G. poeyi;* all of which, so Crosse tells us (Journ. de Conch. xxx. 1890, p. 262), are but stages in the development of *G. ancyliformis*.

In Trinidad the genus occurred to Guppy in the form described by him (Proc. Sci. Assoc. Trinidad, Dec. 1872) as *G. crepidulina*, and figured Am. Journ. Conch. vi. 1870, pl. XVII. ff. 10 and 11.

From Mexico the genus is doubtfully indicated by Gibbons (Journ. of Conch. iii. p. 267).

An undetermined species was recorded (Am. Journ. Sci. (3), xxiii. p. 248) by Cook from the State of New York.

On the banks of the Potomac River Stimpson discovered *G. meekiana*, which he figured and described (Proc. Boston Soc. Nat. Hist. 1863, p. 249). This account, the best of the genus that has appeared, was transferred by W. G. Binney to the pages of "The Land and Freshwater Shells of North America," Pt. ii.

In California the genus is represented by *G. californica*, Rowell, whose description is also reprinted with additional figures by Binney from the Proc. Cal. Acad. Nat. Sci. 1863, iii. p. 21.

As a fossil, *Gundlachia* occurs in S. Carolina in a quaternary marl containing mastodon bones (Cook, *l.c.*).

Boettger has ventured to name an immature fossil from the Mayence Basin—*G. francofurtana* (Fischer's Manuel, p. 505).

A defective monograph of the genus by Clessin appeared in 1882 in the Conchylien Cabinet, Bd. i. Abth. 6, pp. 1-5.

The existence of this genus in Australasia was first announced by R. M. Johnston, who in March, 1877, laid before the Royal Society of Tasmania an account of *G. petterdi*, from the vicinity of Launceston in North Tasmania. In the first of two plates attached to "Critical Observations on Recent Contributions to our Knowledge of the Fresh-Water Shells of Tasmania," Pt. i., Proc. Roy. Soc. Tasmania, 1888, p. 84, but which Mr. Johnston, perhaps critically, omitted to number or explain, are drawings 2a, 2b, 2c, presumably of this species. Appended to this paper is a table in which, under "General Remarks," a *Gundlachia beddomei* is mentioned as described "since 1881" by Petterd, which form is asserted to be "undistinguishable from *Gundlachia petterdi*." I believe that I am correct in stating that no species has ever been described under this title. The Quarterly Journal of Conchology contains in Vol. iv. p. 150, a notice of a new and nameless mollusc by W. F. Petterd, dated Nov., 1883, and evidently relating to the form written of by Johnston.

Prof. Tate recorded (Proc. Roy. Soc. Tasmania, 1884, p. 216) *G. petterdi* from the hill streams of the Mount Lofty Ranges near Adelaide.

Finally in a paper I have had the honour of communicating to you this evening, Suter declares the existence of an undetermined and probably new species from New Zealand.

The broken range of *Gundlachia* has attracted the attention of several conchologists; Petterd (Journ. of Conch. i. p. 399), Fischer (Manuel, p. 251), Tate (Rep. Austr. Assoc. Adv. Sci. 1887, p. 325), Spencer *(op. cit.* 1892, p. 96), and Suter (N.Z. Journ. Sci. iii. p. 252) have each commented thereon. The fluviatile mollusca of southern Australia have, strange to say, a stronger likeness to those of New Zealand than to those of the northern part of this continent. *Amphipeplea*, *Potamopyrgus*, and *Gundlachia* are confined to Tasmania and to the south-east fringe of Australia; they all reappear in New Zealand, but the *Vivipara* and *Melania* characteristic of tropical and subtropical Australia have failed to accompany them there. The extension of *Potamopyrgus*, *Gundlachia*, and, according to Tate, perhaps *Amnicola*, with another Australian genus, *Mycetopus,* to America is even more remarkable.

To explain similar instances, Mr. H. O. Forbes (to whose courtesy I am indebted for a copy of his very interesting paper) has lately revived the theory of an Antarctic continent and supports it by several weighty arguments, notably the presence in the Patagonian Eocene of marsupial remains nearest allied to those now existing in Australia. A strip of land, with a mild climate, extending across the Pole from Tasmania to Tierra del Fuego, would have afforded a possible route* for the migration from America to Australia of these Tertiary marsupials. But such a land could not have been connected with New Zealand, or the marsupials would have wandered there also. A great southward extension of Tertiary New Zealand, considered probable by Sir J. Hector,† would, however, have availed to people the latter with much of the fauna and flora of the suppositious Antarctic land, in the way that European plants and plants are believed to have reached the Azores.

This theory of the origin of Australian marsupials would also account for the discontinuous distribution of *Gundlachia.*

The Australasian members of the genus known are *G. petterdi,* Johnston, *G. beddomei,* Petterd, MS., and *G.* sp., undetermined and probably new, from New Zealand.

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* Had the alternative route advocated ("Island Life," 2nd ed. p. 497) by Wallace, "over what is now the Java Sea," been used by the marsupials, then Timor and the South-Eastern Austro-Malayan Islands should, as Forbes logically remarks, have preserved some remnants of the migrants amid surroundings so like Australia (Vol. iii. p. 22, Supplementary Papers, Royal Geographical Society, 1893). Spencer has demonstrated (Rep. Aust. Assoc. Adv. Sci. 1892, p. 118) "that the diprotodonts had their origin in the Euronotian region," which also seems to me, though not to him, to indicate the south rather than the north-west as the point of marsupial ingress into Australia. In his latest paper Prof. Zittel says (Geol. Mag. Nov. 1893, Vol. x. p. 512): "For its [*i.e.*, Australia's] connection at one time with South America, the abundant occurrence of fossil marsupials in the Santa-Cruz beds of Patagonia is valid evidence." See also Lydekker, "Nature," May 5, 1892, Vol. xlvi. pp. 11-12.

† Address to the Geological Section of the Aust. Assoc. Adv. Sci. Adelaide, 1893.

G. PETTERDI, Johnston, 1879.

Synonym.—*woodsi*, Johnston, 1879.

References.—Proc. Roy. Soc. Tasmania, 1878 (1879), pp. 23, 25; 1884 (1885), p. 216; 1888 (1889), pl. . ff. 2a, 2b, 2c (shell and animal), and table facing p. 86. Journ. of Conch. i. 1878, p. 400; ii. 1879, pp. 87, 137; iv. 1883, p. 150. Conch. Cab. Band i. Abth. vi. Ancylinæ, p. 73, t. 9, f. 8 (3 figures of shell, poor). Victorian Naturalist, Vol. x. Dec. 1893, p. 148, left engraving.

Shell (ff. 1-3) consisting of two portions, which I will refer to as the primary and the secondary shell respectively. The primary may not be called the "larval" shell, that term being already appropriated to the shell of the veliger phase. Primary shell elliptical, above patella-shaped, beneath flat, attached to the secondary shell for three-quarters of its length and, as viewed from above, affixed thereon at an angle of 35°. Secondary shell regularly ancyliform, aperture squarely oval, straight-sided, and wider before than behind.

Sculpture: the primary shell is concentrically marked by numerous raised growth lines, sometimes, not always, by weak raised radiating hair lines. The secondary shell is also ornamented by raised concentric growth ridges, about a dozen of the earlier of these are stouter, the later fainter and closer together. These incremental lines are widest apart at the right anterior corner, showing a tendency in the shell towards spiral growth. Sometimes weak radiating ridges also occur. Under a low power the whole external surface appears shagreened; this I believe is owing merely to the tattered condition of the epidermis.

Colour: the shell itself is nearly transparent and colourless, the epidermis is thick and black, giving to the primary shell a dull black and to the secondary a grey aspect; the stouter concentric ribs of the secondary shell are an ochreous-yellow.

Viewed from beneath, the whole of the primary shell is visible, seen either through the substance, or projecting beyond the edge, of the secondary shell. The primary communicates with the secondary by a semilunate orifice on the roof of the latter, of which this orifice occupies the central fifth; posterior to this the two shells are soldered together for some distance, the intrusion of the primary shell forming a smooth flat shelf, the edge of which at the orifice is slightly thickened and concave or sinuous. On the left the primary shell actually projects into the chamber of the secondary shell, on the right the wall of the one passes into that of the other. All the interior is smooth, glossy, and sub-nacreous. Total length 3, breadth 2, height 1 mm.

Type in the collection of Prof. Tate.

At present *G. petterdi* appears to be known, as adult, from only three localities: a small shallow stagnant pool near the First Basin, South Esk River, Launceston, Tasmania (Johnston and Petterd), a hill stream at Mt. Lofty, S.A. (Tate), and a chain of shallow stagnant ponds behind the sandhills at Henley Beach, near Adelaide, S.A. (Adcock, Pulleine, and Hedley). In this latter locality they were associated with *Planorbis*, *Bulinus*, and *Ancylus*, the latter only determined by the shell. Their habit was to cling to drowned leaves and sticks, or to the submerged leaves and stems of water plants. So closely do they resemble *Ancylus* that a careful observer may, in the field, easily mistake one for another.

The precise mode of the growth of the shell does not seem to have been related by any writer. Johnston says (Proc. Roy. Soc. Tasmania, 1878, p. 24): "In the young state the shell is simple and resembles the common *Ancylus* in the same neighbourhood."

From the fact that *Ancylus woodsii (op. cit.* p. 23) is omitted by its author from his last catalogue *(op. cit.* 1890, p. 145) I infer that he now considers that name to be a synonym, and further that he considers it a synonym of *G. petterdi*. If so, it is a matter for regret that Mr. Johnston has withdrawn his species in a manner to confuse a student of his writings.

The published figures of the juvenile shell only represent the stage at which the septum is completed and the secondary growth is about to occur. Thanks to a series of specimens collected by

Mr. Suter in New Zealand, which probably represent the fry of an undescribed species, I am enabled to detail the process. My friend supposes that in unfavourable circumstances a septum is never formed, a view which his American experiences had already suggested to Gibbons. If this be the case, and *Gundlachia* sometimes continues to regularly enlarge the ancyliform shell, then only an anatomical examination could distinguish between the genera; and although several supposed species have been named and, more or less adequately, described as Australian, yet this hypothesis would require proof of the existence of *Ancylus* in Australia.

The first deviation shown by young *Gundlachia* from *Ancylus* consists of a fold appearing at the posterior end of the aperture (fig. 13). No increase occurs round the rim of the ancyliform shell until the fold is built into a septum flooring half or two-thirds of the original shell. This septum is flat and grows asymmetrically, the right margin advancing before the left. At this stage the shell has much resemblance to a spectacle-case, and has been well figured by Pfeiffer. Vigorous growth now occurs; in front, but in an altered plane, the margin of the ancyliform shell is continued outwards, behind, the shell is spread beneath the septum floor to form the roof of the secondary shell, then leaving the septum it is abruptly bent downwards. A slight inclination to spiral growth is shown by the increase on the right exceeding that on the left.

Stimpson suggests "that the *Gundlachia* commences its life as an *Ancylus*, . . . it passes the first summer and autumn of its existence in this smaller shell, and that the septum, which afterwards partially closes its aperture, is formed during the period of inaction which ensues during the winter. This septum would in some degree serve as a protection to the mollusc during this period, in the same way as the epiphragm of the *Helices*. In the following spring—the period of greatest activity in growth with all the fresh-water Pulmonates—the animal throws forth its newer and larger shell, retaining the older one on its back for the protection of its more tender viscera."

I regret that I can give but a meagre account of the soft parts. My only material was some specimens procured at Adelaide, which died on the voyage to Sydney and were hastily and badly preserved on board the steamer.

The external appearance of spirit specimens is conveyed by figs. 7 and 8. Part of the liver and the hermaphrodite gland are pinched off into a sort of tail, which occupies the primary shell. With this exception, as Gundlach and other observers have remarked, there is no difference from *Ancylus*. The form and disposal of the stomach and intestines seemed, as well as I could ascertain, to agree with those of *Ancylus* figured by Moquin-Tandon.

Jaw (fig. 9) extremely minute and frail, about $\frac{3}{4}$ the length of the radula, very narrow, composed of a great number of separate imbricating plates (fig. 10), which appear to be arranged two deep, in contact but unattached, each is oblong in shape and serrate at one end, resembling somewhat the scales on some butterflies' wings.

The difficulty of observing this tender and incoherent organ will account for the uncertainty that prevails regarding it. Troschel saw it, described it, and then unfortunately concluded that it was a piece of hardened skin. Stimpson failed to find it. Johnston noticed it in *G. petterdi.* In *Latia* Hutton asserts (Trans. N.Z. Inst. xiv. p. 156) that no jaw exists; it has more probably been overlooked.

Radula (fig. 11) a narrow parallelogram, very small, measuring about 3 × 1 hundredths of an inch. Formula, 70 rows of 8 : 12 : 1 : 12 : 8. Each half row straight, meeting at a low angle in the centre. Rachidian with a long slender basal plate, rounded and slightly expanded posteriorly; reflection about a fifth of total length, bicuspid. Laterals with broad basal plates, emarginate at the proximal posterior corner, sloping away from the rachidian, reflection somewhat pyriform, the wide end proximal, set aslant on the basal plate and armed with a large proximal and two minor distal cusps. Marginals more upright, with reflection of same pattern, but extending almost the length of the basal plate.

G. BEDDOMEI, Petterd, MS.

References.—Journ. of Conch. iv. p. 150. Proc. Roy. Soc. Tasmania, 1888 (1889), table facing p. 86; 1890, p. 145. Victorian Naturalist, Vol. x. Dec. 1893, p. 148, right engraving.

From the preceding this hitherto uncharacterised species may be distinguished by attaining one-third larger dimensions, by its mahogany colour, by its wider and more rounded aperture, by the more posterior position of the orifice of the primary shell, and by that shell being affixed to the secondary more in the plane of its greatest length, at about an angle of 25° to the median line. Length 4½, breadth 3, height 1 mm.

Type in Mr. Petterd's collection.

This species has only been found in South Tasmania. It was collected by Mr. Beddome in a quarry hole at the old station near his residence at Hillgrove. Recently I have received from Mr. Beddome two half-grown *Gundlachia*, which I identify with this species, collected by his friend Mr. May near Sandford, Tasman's Peninsula.

In asserting that this species is indistinguishable from *petterdi*, Johnston is inaccurate. That differences are to be discerned I hope to have shown by drawings and descriptions. It is possible that the future may produce forms linking one to the other, but our present knowledge is confined to the inhabitants of a few tiny pools and is insufficient to discuss the fixity or flexibility of their specific features.

CONCLUSION.—The genus *Gundlachia* contains four American—*G. ancyliformis*, *meekiana*, *californica*, *crepidulina*—and two Australian species—*G. petterdi* and *beddomei*. It is nearly allied to *Ancylus*, from which it differs anatomically by a distinct pattern of radula, and conchologically by its compound shell. The existence, variously affirmed and denied, of a jaw is now demonstrated by figures. It has been suggested, but not proved, that in unfavourable circumstances the shell never attains its compound development, but remains simple. From an *Ancylus* of the same size the subcentral nucleus and regular elliptical outline distinguish young *Gundlachia*.

A fuller knowledge of the development and structure of the genus is very desirable.

The nearest, in phylogenetic array, to *Gundlachia* are probably the New Zealand *Latia* and the Tasmanian *Ancylastrum*. Should Hutton's *Latiidæ* win acceptance, which seems doubtful, it might include these.

The distribution of *Gundlachia* agrees in part with that of the recent marsupials, and the theory of a Mesozoic or older Tertiary migration to or from Australia across the south pole, when a lost land with a mild climate united Tierra del Fuego to Tasmania, would explain its present position.

EXPLANATION OF PLATE XXIV.

Figs. 1, 2, and 3.—Ventral, lateral, and dorsal aspects, magnified, of a shell of *G. petterdi*, Johnston; collected by Mr. Petterd in a small pool north of the First Basin, near Launceston, Tasmania.

Figs. 4, 5, and 6.—Ventral, lateral, and dorsal aspects, magnified, of a shell of *G. beddomei*, Petterd (type specimen), from a pool in the quarry at the old station near Hillgrove, Brown's River Road, Hobart, Tasmania. These six sketches are drawn to the same scale to exhibit difference in size and outline, from specimens kindly loaned for the purpose by W. F. Petterd, Esq.

Fig. 7.—Lateral view of an animal of *G. petterdi*, withdrawn from the shell after saturation in alcohol. Enlarged.

Fig. 8.—Dorsal view of another example. Enlarged.

Fig. 9.—Jaw of *G. petterdi*, as seen crushed under the cover glass and viewed with 1 in. objective.

Fig. 10.—portion of the same, viewed with ⅛th in. objective.

Fig. 11.—Central portion of two rows from the radula of *G. petterdi*, much magnified. Figs. 7-11 from specimens collected at Henley Beach, near Adelaide, by H. B. Pulleine, Esq., and the writer.

Figs. 12, 13, 14, and 15.—Illustrate stages in the growth of *Gundlachia* sp., from specimens collected in the River Avon, near Christchurch, N.Z., by H. Suter, Esq.

DESCRIPTION OF A NEW SPECIES OF *ACACIA*.

By J. H. Maiden, F.L.S., and R. T. Baker, F.L.S.

(Plate xxv.)

Acacia Muelleriana, n.sp.

A handsome shrub or tree, 20 feet in height as seen, and bearing some general resemblance to *A. decurrens*, var. *normalis*, but from which it differs in important points; glabrous in all its parts; branches terete, except perhaps the extremities, slightly decurrent at the junction of the branchlets, resembling in this respect in a slight degree some forms of *A. decurrens*, var. *mollis.* The young shoots show no distinctive coloration such as is found in the varieties of *A. decurrens* and *A. dealbata.* Pinnæ mostly one pair, rarely three pairs, leaflets linear, not numerous, mostly six, nearly one line broad, over twelve lines long, obtuse, gradually narrowing to the base, often curved at the free end. Glands few, one at the base of each pair of pinnæ, the lower one a little removed from the point of juncture. The common petiole winged on the upper edge. Flower heads exceedingly small, on filiform peduncles in axillary racemes on the branchlets, about as long as or scarcely exceeding the leaves, 6 to 12 in a raceme; the upper ones forming a loose terminal panicle. Flowers 5 to 8 in the head. Calyx-lobes acute, nearly half the length of the corolla. Petals glabrous, slightly ribbed. Pod glabrous, thin, moniliform in many cases, much longer than any of the varieties of the *decurrens* group, 5 to 7 inches long, about 4 lines broad. Seed ovate, longitudinal; funicle thickened into a club-shaped aril under the seed, with a short fold below it.

Hab.—Foot of ranges forming the southern watershed of the western branches of the Hunter River, New South Wales *(J. Dawson).*

Owing to the unusually long leaflets it is not easy to assign a relative position to this species in Bentham's Bipinnatæ group as defined in the Flora Australiensis. Of the three subdivisions of this group, it belongs to the Botryocephalæ series, and its having one to three pairs of pinnæ ranges it with *A. elata*, *pruinosa*, *spectabilis*, *polybotrya*, and *discolor*, while the narrowness of the leaflets seems to connect it with *A. decurrens.* The gland a little removed from the lowest pinnæ indicates some affinity to *A. pruinosa.* As the slightly decurrent stem and a general facies seem to connect it with *A. decurrens*, it has been provisionally placed between that species and *A. discolor*, with which it can claim a remote kinship in the fewness of the pinnæ and leaflets.

We think it is very appropriate to dedicate this interesting new *Acacia* to Baron von Mueller, K.C.M.G., to whom botanists are indebted for his classical "Iconography of Australian *Acacias.*"

EXPLANATION OF PLATE XXV.

Acacia Muelleriana.

Fig. 1.—Twig of plant in bud.
Fig. 2.—Flower-head (enlarged).
Fig. 3.—Separate flower (enlarged).
Fig. 4.—Pod.
Fig. 5.—Seed (enlarged).
Fig. 6.—Lateral view of petiole (enlarged), showing glands and wing on upper edge.

NOTES ON THE RED-CROWNED PARRAKEET *(CYANORHAMPHUS COOKI)* OF NORFOLK ISLAND.

By Alfred J. North, F.L.S., Assistant in Ornithology, Australian Museum.

(Plate xxvi.)

In describing the eggs of the Red-crowned Parrakeet of Norfolk Island at the November Meeting of this Society last year, I made some remarks upon the specific name under which this parrakeet was recognised and known by different authors, pointing out that Dr. Finsch and Sir Walter Buller considered it a variety of *Cyanorhamphus novæ-zealandiæ*, and ranked the name *C. rayneri*, of Norfolk Island, under the synonymy of the New Zealand species, while Count Salvadori considered the Norfolk Island form *C. rayneri* the same as *C. cooki*, and quite distinct. I summarised my remarks by stating :—" If *C. rayneri* of Norfolk Island is the same as *C. cooki* of New Zealand, as stated by Count Salvadori, I should not be surprised to find, upon the examination of a large series of skins of the Red-fronted Parrakeet of Norfolk Island, that it is only an occasional and by no means constant variety of *C. novæ-zealandiæ*, not meriting even subspecific distinction." This opinion was based upon my knowledge of the extraordinary variation to be found in the extent of the colour on the head, and the size of *C. novæ-zealandiæ*, having examined over 150 living specimens that were captured in the South Island of New Zealand, and upon the original description and habitat of *C. cooki* given by Gray, who states it is " Like *P. novæ-zealandiæ*, but much larger. *Hab.*—New Zealand."*

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*G. R. Gray, List Psitt. Brit. Mus. p. 13 (1859).

In the July number of "The Ibis," Count Salvadori has referred to the above notes and makes the following remarks:—"Mr. North, who does not seem to have ever seen a *Cyanorhamphus* from Norfolk Island, is mistaken as regards my admitting that the type of *C. cooki* ever came from New Zealand. In fact, as the 'habitat' of this species *(op. cit.* p. 585*), I have given 'Norfolk Island' only. The locality 'New Zealand' to specimen *a* (the type of *Platycercus cooki)* is included between square brackets, which means that, according to my belief, it is wrong. In fact, the alleged locality is not supported by any reliable authority, the specimen having belonged to the old 'Bullock Collection.' In conclusion I may say that I am quite persuaded that the type of *C. cooki* (like the type of *C. rayneri)* is a specimen from Norfolk Island, which has been wrongly labelled 'New Zealand,' and that *C. cooki* is a perfectly distinct species, quite different from *C. novæ-zealandiæ.* If the Australian and New Zealandian naturalists will take the trouble to bring together specimens of the genus *Cyanorhamphus* from the different islands, they will find that they belong to insular forms perfectly distinct from one another."

As Count Salvadori correctly surmised, I had not at that time seen a specimen of *Cyanorhamphus* from Norfolk Island, and my remarks that the insular form might prove to be a by no means constant variety of *C. novæ-zealandiæ* were principally founded upon Gray's meagre and misleading original description of *C. cooki*, and the *habitat* given by him to the type specimen, and did not refer to Count Salvadori at all beyond the fact that he had examined the types of *C. rayneri* and *C. cooki* and pronounced them to be one and the same species.

From Dr. P. Herbert Metcalfe, the Resident Medical Officer at Norfolk Island, I have recently received in spirits two specimens of the Red-crowned Parrakeet, procured on the island on the 3rd of October, 1893, and which have been since skinned, and are exhibited here this evening. Immediately upon examining the specimens I found them to be quite different and specifically distinct from *C. novæ-zealandiæ,* being larger and having a more robust bill; the crimson colour on the forehead and vertex more extended, and *the spot on the ear-coverts but slightly indicated by obscure crimson,* as pointed out by Gray in his description of *C. rayneri** and by Count Salvadori in his description of the type specimen of *C. cooki,*† instead of *the streak across the eyes terminating on the ear-coverts in deep crimson* as in *C. novæ-zealandiæ.*

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* Brit. Mus. Cat. Vol. xx. 1892.

In the "Old Collection" of the Australian Museum are two mounted specimens similar to those procured by Dr. Metcalfe, labelled "*Platycercus,* New Zealand," but the localities are not authenticated, and there is no doubt that they were obtained on Norfolk Island.

I have never seen any *Cyanorhamphus* from New Zealand like the four specimens just referred to, and I share with Count Salvadori the belief that the wrong habitat was given by Gray to *C. cooki,* the name under which the Norfolk Island species of *Cyanorhamphus* must now be known. *C. rayneri* will therefore rank as a synonym of *C. cooki,* which is to be regretted, for ornithologists who have only Gray's misleading description of *C. cooki* will never be able to recognise in it the species of *Cyanorhamphus* which inhabits Norfolk Island.

Appended I have given the measurements of *C. cooki* and *C. novæ-zealandiæ.*

Measurements of *Cyanorhamphus cooki*:—

Sex.	Total Length.	Wing.	Tail.	Bill from Nostril.	Width of Upper Mandible.	Width of tip of Lower Mandible.	Tarsus.	Outer Fore Toe.	Claw.
A 1 ♂	12·5	5·6	6·8	0·8	0·53	0·3	0·88	0·86	0·46
A 2 ♀	11·7	5·2	6·2	0·65	0·47	0·23	0·82	0·81	0·42
A 3 ♂	12·1	5·8	6·9	0·83	0·52	0·3	0·84	0·86	0·45
A 4 ♂	11	5·6	6·9	0·87	0·5	0·3	0·84	0·84	0·4

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* G. R. Gray, Ibis, 1862, p. 228.

† Brit. Mus. Cat. Vol. xx. 1892, p. 585.

A 1 ad. ♂ sk. (measurements taken in the flesh), Norfolk Island, Oct. 3rd, 1893 (Dr. P. H. Metcalfe).

A 2 ad. ♀ sk. (measurements taken in the flesh), Norfolk Island, Oct. 3rd, 1893 (Dr. P. H. Metcalfe).

A 3 ad. ♂, mounted, "Old Coll.," Australian Museum, labelled "*Platycercus*, New Zealand."

A 4 ad. ♂, mounted, "Old Coll.," Australian Museum, labelled "*Platycercus*, New Zealand."

Measurements of *Cyanorhamphus novæ-zealandiæ* :—

Sex	Total Length of Skin.	Wing.	Tail.	Bill from Nostril.	Width of Upper Mandible.	Width of tip of Lower Mandible.	Tarsus.	Outer Fore Toe.	Claw.
A 1 ♂	9·5	5	5·5	0·62	0·42	0·22	0·75	0·72	0·31
A 2 ♂	10	5	5·5	0·63	0·44	0·23	0·77	0·75	0·38
A 3 ♀	9·4	4·9	5·2	0·54	0·33	0·2	0·71	0·69	0·3
A 4 ♀	9	4·8	5·5	0·55	0·39	0·2	0·73	0·7	0·3

A 1 ad. ♂ sk., Dunedin, South Island, New Zealand, Feb., 1893 (A. Lehmert).

A 2 ad. ♂ sk., Dunedin, South Island, New Zealand, Feb., 1893 (A. Lehmert).

A 3 ad. ♀ sk., Dunedin, South Island, New Zealand, Feb., 1893 (A. Lehmert).

A 4 ad. ♀ sk., Dunedin, South Island, New Zealand, Feb., 1893 (A. Lehmert).

In answer to Count Salvadori's expressed wish that Australian and New Zealandian naturalists should collect specimens of the genus *Cyanorhamphus* from the different islands, I can assure him as regards Lord Howe Island it has been diligently searched at various times by such keen enthusiasts as Mr. George Masters and Mr. J. A. Thorpe, but not a single specimen of *Cyanorhamphus* was ever obtained by them. At the time of the visit of the Australian Museum party, Messrs. Etheridge, Whitelegge, and Thorpe, in September, 1887, and who remained three weeks on the island, they were informed by the inhabitants that this parrakeet had at one time existed in large numbers, but had gradually disappeared about ten years ago. Since their stay on the island Mr. T. R. Icely, the Visiting Magistrate, has on behalf of the Trustees of the Australian Museum acquired from the islanders many rare specimens, but not a parrakeet amongst them.

For the past ten years or more on Norfolk Island Dr. P. H. Metcalfe has assiduously worked up the avifauna of his island home by collecting the birds, nests, and eggs, many of which, exhibited before this Society, had not been previously recorded from Norfolk Island.

So far as these insular dependencies of New South Wales are concerned, it will be seen that no opportunity has been lost of obtaining specimens or gaining information that would contribute to our knowledge of the avifaunas of Lord Howe and Norfolk Islands.

EXPLANATION OF PLATE XXVI.

Fig. 1.—Head of *Cyanorhamphus novæ-zealandiæ*, Sparrm.
Fig. 2.—Head of *Cyanorhamphus cooki*, G. R. Gray.

DESCRIPTION OF A NEW CYSTIGNATHOID FROG FROM NEW SOUTH WALES.

By J. J. Fletcher.

Crinia haswelli, n.sp.

Vomerine teeth in two distinct slightly oblique groups behind the choanæ. Snout rounded, longer than (in ♂) or about as long as (in ♀) the orbital diameter; nostril slightly nearer the eye than the tip of the snout; interorbital space broader than (in ♂) or about as broad as (in ♀) the upper eyelid; tympanum quite hidden. First finger about as long as second; toes slightly fringed; subarticular tubercles well developed; two small metatarsal tubercles, the outer one very small, or wanting or not perceptible (in ♂); no tarsal fold. The hind limb being carried forwards along the body, the tibio-tarsal articulation reaches to between the eye and the shoulder. Upper surfaces smooth, but with some small indistinct scattered warts especially posteriorly; belly—but not the throat and chest—and the lower and hinder surfaces of the thighs near the symphysis granular. In life a rich chestnut-brown or a silvery-grey or drab above, with an incomplete broad darker band down the middle of the back commencing between the eyes very much as in *Hyla ewingii*, changing in spirit to a dull chocolate-brown or a light ashy-grey; minutely specked with black; a light vertebral line; a black band on each side of the head commencing at the nostril, at first narrow and sometimes imperfect, passing through the eye and extending back as far as above the shoulder, sometimes interrupted, sometimes light-edged superiorly: a carmine or orange-red spot on the loin on each side close to the groin: à larger one on the hinder side of each thigh, and on the inner surface of each calf, the bright colour not so 'fast' as in some species of the genus but soon more or less discharged in spirit: throat dark brown or blackish, sometimes with a few light specks; belly and thighs with light spots on a dark brown or blackish ground. Male with a subgular vocal sac.

Five specimens: two (♀) 30 mm. from snout to vent; one [♀ juv. (?)] 20 mm.; two (♂) 24-26 mm.

Hab.—Near the head of Jervis Bay.

In his Synopsis of the species of *Crinia* (B. M. Catalogue, p. 264) Mr. Boulenger makes two groups: those with and those without the lower surfaces granulate. The new species belongs to the first of these which includes *C. georgiana*, Bibr., and *C. signifera*, Gir., but it has relatively less extent of granulate surface than either of them. From the former *C. haswelli* is at once distinguishable by the dark throat and chest, and the maculate belly; from the latter by the different coloration, and the presence of vomerine teeth.

In September last at the invitation of Professor Haswell I had the pleasure of joining a small dredging and collecting party organised by him to visit Jervis Bay. On that occasion two specimens of the new *Crinia* were obtained. A month later in company with Mr. Hill I made a second brief visit, but a good deal of searching resulted in only three additional specimens.

I avail myself of this opportunity of pointing out that the first sentence of my description of *C. froggatti* [P.L.S.N.S.W. (2), vi. (1891), p. 275] should be amended so as to read—Vomerine teeth in two small groups behind the choanæ, rarely absent. On a re-examination of eleven specimens still in my possession, I find that nine have vomerine teeth; but that in two the vomerine teeth are absent or imperceptible.

CONTRIBUTIONS TO A MORE EXACT KNOWLEDGE OF THE GEOGRAPHICAL DISTRIBUTION OF AUSTRALIAN BATRACHIA. No. iv.

By J. J. Fletcher.

To the kindness of Messrs. A. Sidney Olliff, C. T. Musson, J. H. Rose, W. W. Froggatt, R. Helms, and in particular Mr. A. M. Lea, I am indebted for the additional material upon which the following notes are based. Mr. Lea's specimens, referable to nineteen species, or more than half the total number of species found in New South Wales, were obtained on the Lower Clarence and the Northern Tableland. Those from the former locality are of interest as being supplementary to an important collection which I have already recorded from the Richmond River. Those from the Tableland are not less important because collections from this part of the colony have hitherto not been obtainable; and, as previously pointed out, the peculiar distribution of a few species seems in some measure to be due to the proximity of the sources of the eastern and western waters in this region, the coastal portion of which is so favourable to animal life.

(i.) *The coastal division of N.S.W.*

(u) From the Maclean on the Lower Clarence (Mr. A. Sidney Olliff).

Hyla cærulea, *H. chloris*, and *Hylella bicolor.*

(v) From the Lower Clarence [Ulmarra to Chatsworth] (Mr. A. Lea).

Limnodynastes peronii
ornatus

Hyla cærulea
peronii

Cryptotis brevis
Pseudophryne coriacea
Hyla chloris, Blgr.
Hyla dentata
aurea
nasuta
Hylella bicolor

Of the thirteen species represented in Mr. Helms' collections from the Richmond River, six are to be found in Mr. Lea's collections. The Northern River Districts may thus be credited with twenty species, of which I have noted eighteen, two (*Chiroleptes* sp.[*] and *Hyperolia marmorata*) having not yet come under my notice. Ten of them are recorded in the B. M. Catalogue (2nd ed.) from the Clarence, and twelve (including *H. verreauxi* and *Litoria marmorata*, A.D., a species omitted from his latest list) by Mr. Krefft, also from the Clarence.

Phanerotis is at present known only from one locality on the Richmond River. *Cryptotis* is one of the commonest species, if one may judge from the numerous specimens usually present in collections. To the south I have found it sparingly just outside the limits of the County of Cumberland, on the eastern portion of the Blue Mts., at Grose Vale, and near Springwood, but not further west; thence it extends northwards to Queensland, as far at any rate as Pimpana, and Ipswich (Krefft), and westward to the Tableland at Bald Nob. The localities given in the B. M. Catalogue for specimens presented by Mr. Krefft, are Clarence River and Macquarie River. The latter is evidently a *lapsus calami* for Port Macquarie on the Hastings River, for not only is *Cryptotis* a coastal species but Mr. Krefft expressly says of its habitats, "Clarence, Richmond and Hastings Rivers and Queensland (neighbourhood of Ipswich)."

H. nasuta would appear to have been confounded with *H. freycineti* (perhaps also with *H. latopalmata*) by Mr. Krefft, who reported it as a Sydney frog. It is a Queensland species which, as far as present knowledge goes, reaches its southern limit about the Clarence.

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[*] *C. australis* according to Mr. Krefft and Dr. Günther; *C. albopunctatus* (?) according to the B. M. Catalogue (2nd edition).

H. chloris, Blgr., either ranges to the north as far as Cairns, or it is very closely allied to *H. gracilenta*, Peters. In the Macleay Museum is a series of specimens of a frog which I have been accustomed to regard as *H. gracilenta*, collected at Cairns by Mr. W. W. Froggatt. On comparing these with my fine series of specimens of the Richmond and Clarence frog, I am disposed to regard them as referable to one and the same species.

Hylella bicolor is an elegant little frog of which until recently I have been unable to obtain examples; and then almost simultaneously they reached me from three different sources. It has a fairly wide but discontinuous distribution (northwards to Cape York); but where it does occur it is reported as common. My first examples were given to me by Mr. Musson, who obtained them near the western limits of the County of Cumberland. Then Mr. Olliff and Mr. Lea gave me specimens from the Lower Clarence; and it is also contained in an earlier collection of Mr. Lea's from Armidale and Tamworth, in which the specimens from the two localities were not kept separate; those of *Hylella* were probably obtained at Armidale, but the other six species in the collection [*Limnodynastes tasmaniensis, L. salminii, Hyperolia marmorata, Pseudophryne bibronii, Hyla cærulea, H. lesueurii* and var. (?)] might very well have come from either locality.

The County of Cumberland may be credited with twenty-one species, of which I have seen all but *H. dimolops*. Of a total of thirty-seven species at present attributable to the colony, thirty-two occur in the Coast Districts. From the numbers given above, which represent those for the two districts best known at some distance apart, it is evident that the thirty-two species are not by any means all uniformly distributed.

(w) From Jervis Bay.

Limnodynastes peronii
dorsalis
Crinia signifera
haswelli, Fl.
Hyperolia marmorata
Pseudophryne bibronii
Hyla aurea
peronii
H. dentata

This is the most southerly coastal locality from which I have up till now been able to obtain specimens. Though in the time at my disposal the area collected over—a rather sandy tract in proximity to swamps—was not of great extent, half-grown specimens of *H. dentata* were surprisingly numerous, some of them jumping about in the grass.

On the occasion of my second brief visit (early in October) *L. dorsalis* at least was spawning vigorously. In more suitable country a few miles off near Tomerong, and in an umbrageous creek between Tomerong and Nowra, *H. phyllochroa* was croaking vigorously and preparing to spawn. In the B. M. Catalogue (2nd ed.) *H. phyllochroa* is recorded only from Sydney [and Errumanga], and *H. dentata* only from Sydney. The range of these two species, from present knowledge, may be said to be from Jervis Bay (probably even further to the south, but not extending to Victoria) northwards to the Clarence and Richmond (probably into Queensland), and westward to the western slopes of the Blue Mts.

My hopes of finding that extremely rare frog *Hyla jervisensis* were not realised. Though described by Duméril and Bibron so long ago as 1843, the species is, I believe, still known only from the type specimen obtained during the voyage of Péron and Lesueur.

(ii.) *The Northern Tableland.*

(x) From Bald Nob, a few miles N.E. of Glen Innes (Mr. A. M. Lea).

Limnodynastes peronii
tasmaniensis
Cryptotis brevis
Crinia signifera
Pseudophryne bibronii
Hyla ewingii var. *calliscelis*

In this locality *L. peronii* and *Cryptotis* are apparently stragglers from the coast.

(y) From Glen Innes; 3518 feet; 90 miles from the coast (Mr. A. M. Lea).

Limnodynastes tasmaniensis
Crinia signifera
Pseudophryne bibronii
Hyla ewingii var. *calliscelis*

(z) From Inverell; 1953 feet; 40 miles west of Glen Innes (Mr. A. M. Lea).

Limnodynastes tasmaniensis
dorsalis
Crinia signifera
Hyperolia marmorata
Pseudophryne bibronii
Hyla cœrulea
ewingii var. *calliscelis*
sp.*

(iii.) *The Southern Tableland.*

(aa) From Bathurst; 2200 feet (Mr. W. W. Froggatt).

Limnodynastes dorsalis
Pseudophryne bibronii
Hyla ewingii var. *calliscelis*
sp.†

(bb) From Bungendore; 2290 feet; 4 miles south of Lake George (Mr. W. W. Froggatt).

Limnodynastes tasmaniensis
Hyperolia marmorata
Crinia signifera
Pseudophryne bibronii
Hyla ewingii var. *calliscelis*

(cc) From Pretty Point, Mt. Kosciusko Plateau (Mr. R. Helms).

Crinia signifera
Hyla ewingii var. *calliscelis*

(iv.) *The Plains.*

(dd) From Tamworth; 1246 feet; 116 miles from the coast (Mr. A. M. Lea).

Limnodynastes tasmaniensis
dorsalis
Hyperolia marmorata
Crinia signifera
Pseudophryne bibronii
Hyla peronii
ewingii var. *calliscelis*
lesueurii

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* A marbled or spotted frog (one specimen; six others in the mixed collection from Tamworth and Armidale) I have not previously met with. From the free fingers, the vomerine teeth, and the webbing of the toes, I I should refer it to the marbled form of *H. lesueurii.*

† One specimen; possibly *H. lesueurii* var., but of a nearly uniform colour without any dark markings.

Two of these species, *H. peronii* and *H. lesueurii*, were represented in Mr. Musson's collection previously recorded from the same place; and *H. cærulea* then obtained is not in Mr. Lea's collection. *H. ewingii* var. *calliscelis* and *H. lesueurii* are probably stragglers from the Tableland, from which indeed Tamworth is apparently not sufficiently remote to exhibit in at all a marked manner the distinguishing characteristics of the subregion.

(ee) From Warialda; 1106 feet; 162 miles from the coast (Mr. J. H. Rose).

Limnodynastes ornatus
Heleioporus pictus

Two specimens of the former and one of the latter, which was turned up by the plough. Mr. Rose could have made a larger collection than this. His supply of spirit being very limited, however, he merely brought three frogs which he had not met with before (at Euroka).

From four localities close to or west of the Divide on the Northern Tableland (including Waroo in S. Queensland) fourteen species have been recorded; from seven localities west of the Divide on the Southern Tableland fifteen species; and from the Blue Mts. east of the Divide seventeen species: total for the Tablelands twenty-one species (including *Pseudophryne coriacea* at Waroo only), but without a single species peculiar to the subregion. Its fauna is made up of more or less cosmopolitan species slightly overlapped by some of the characteristic species of each of the adjacent subregions, for it certainly does separate two groups of genera and species which though they have a good deal in common yet present characteristic differences shown in the subjoined table:—

COAST.	PLAINS.
Mixophyes fasciolatus	*Limnodynastes fletcheri**
Limnodynastes peronii	*Chiroleptes platycephalus*
Cryptotis brevis	*Heleioporus pictus*

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* Possibly only a well-marked variety of *L. tasmaniensis*.

COAST *(contd.)*.

Phanerotis fletcheri
Crinia haswelli
Chiroleptes sp.
Philocryphus flavoguttatus
Pseudophryne australis
coriacea
Hyla phyllochroa
chloris
jervisensis
dentata
krefftii
citropus
freycineti
nasuta
dimolops
Hylella bicolor

PLAINS *(contd.)*.

Notaden bennetii
Hyla rubella

COMMON TO BOTH SUBREGIONS.

Limnodynastes salminii
tasmaniensis
dorsalis
ornatus
Crinia signifera
Hyperolia marmorata
Pseudophryne bibronii
Hyla cœrulea
peronii
ewingii var. *calliscelis*
aurea
lesueurii
latopalmata

In the Northern River Districts and further to the north *L. salminii* and *L. ornatus* are coastal species: elsewhere in New South Wales they are almost among the characteristic species from the Plains, though the latter also extends to the Tableland at Guntawang. *H. rubella*, the only West Australian form among the species from the Plains, is a coastal species in Queensland but not in N. S. Wales. Hence the geographical distribution of the batrachia of Queensland will probably present some differences in detail from that of the New South Wales species, a knowledge of which would materially help to explain certain matters which for the present must remain in doubt.

Analogous cases of a similar remarkable distribution are furnished by certain freshwater fishes, and earthworms. The Murray cod-perch *(Oligorus macquariensis)* and the freshwater cat-fish *(Copidoglanis tandanus)* occur both in the western waters, and in the Northern River Districts in the eastern waters also, the the latter in the Richmond, the former in the Clarence as well as in the Mary River in Queensland. Of a small group of earthworms characterised by the possession of a single male pore, of which *Cryptodrilus purpureus*, Mich., from Gayndah and Peak Downs, is the type, two species (including *C. purpureus* var.) are common in the Northern River Districts, but have not yet been recorded from further to the south, while a third is widely distributed in the interior of New South Wales as far south as the Murrumbidgee.

Chiroleptes platycephalus, recorded only from Bourke, Euroka, and Dandaloo, is at present peculiar to New South Wales, but not improbably it will be found to range further to the north and west; and as it seems to follow the Darling and its tributaries it should also occur further to the south. *Notaden* extends into Queensland, possibly also into Central Australia, but it has not yet been reported from Victoria. *Heleioporus pictus* is common to S. Australia, Victoria, and N. S. Wales, and not improbably ranges into Queensland.

Hyla ewingii var. *calliscelis* and *H. lesueurii* have become well established on the Tablelands and just reach the plains at Tamworth.

Whatever may have been the case in the past, when, as the geologists affirm, the Dividing Range was much higher, at the present time, except perhaps locally, the Tablelands and the Cordillera can hardly be a physical barrier of an insurmountable character to the migration of batrachia from one subregion to another. There is indeed evidence tending to show that characteristic coastal species do as stragglers manage to get a footing on the eastern side of the Tablelands where the conditions are favourable (*e.g.*, *Mixophyes*, *Cryptotis*, *Hyla phyllochroa*, *H. citropus*, and *Pseudophryne australis* in the moist shady gullies of the Blue Mts.; *Hylella bicolor* at Armidale and *Cryptotis* at Bald Nob); just as a few from the Plains (*Limnodynastes fletcheri* and *Heleioporus pictus*) have reached the Tableland at Guntawang or at Waroo.

A much more potent factor in regulating migration seems to be climatic conditions, more particularly the amount of moisture and all that that implies. In other words a number of hardy species seem alike able to flourish under such diverse conditions of life as prevail in the subtropical Northern River Districts, and in the dry country of the western plains. Others seem unable to maintain themselves away from the favourable conditions which attain a maximum in the coastal district and on the eastern side of the Tableland; while others again seem only perfectly at home in a region where the cycle of events may be summed up as devastating floods, disastrous droughts, and intervening good seasons, in varying intensity.

In an interesting paper entitled "Notes upon the History of Floods in the River Darling" (Journ. and Proc. Roy. Soc. of N. S. Wales, 1886, xx. p. 155), Mr. H. C. Russell, B.A., F.R.S., has brought together the records from all available sources, a perusal of which indicates in a very suggestive manner the extremes to which animal life in the interior is exposed. When in a severe drought, as reported by Mr. Russell's correspondents, the country becomes a desert, the swamps, lagoons, and the tributaries of the Darling are dry, and the river itself is reduced to the condition of a chain of waterholes sometimes miles apart and in places salt, it would appear as if at any distance back from what is left of the river frogs must over a considerable area run great risk of absolute extermination unless their æstivating capabilities have become correspondingly developed. The survivors get their opportunity again with a big flood, which may inundate the back country to a distance of twenty, forty, or even seventy miles, once more filling the swamps and lagoons. A succession of good seasons encourages a flux of animal life for a time, with the inevitable ebb when a drought gives the check, the cycle, as Mr. Russell thinks, occupying a period of about nineteen years.

Several of the characteristic species of the Plains are not yet recorded from the southern colonies, and in N. S. Wales they have not all migrated from the coast. If not developed in the subregion there must have been migration at some time from the north. But this and other cognate questions cannot be satisfacfactorily considered until more is known of the fauna of Queensland; though not less to be desired is an up-to-date knowledge of the faunas of West and South Australia and Tasmania.

Mr. A. H. S. Lucas has recently revised the batrachian fauna of Victoria (Proc. Roy. Soc. Vict. 1891, iv. (2), p. 59), bringing up the number of species to sixteen, or less than half the number recorded from N. S. Wales. In this paper Mr. Lucas refers to the distinctness of species on the two sides of the Great Dividing Range in Victoria. At present, however, it is not possible to institute any very satisfactory comparison between the faunas of the two colonies because the groups separated by the Divide in one colony do not present any marked features in common with the corresponding groups in the other. Of the sixteen Victorian species five are peculiar, nine are widely distributed Australian or Eastern Australian forms (seven of them in N. S. Wales being common both to the Plains and the Coast), and two occur outside of Victoria but not or only doubtfully in N. S. Wales; whereas our characteristic species, whether of the Plains (except *Heleioporus pictus*, which Mr. Lucas records from Parwan, south of the Divide) or of the Coast, are not yet known to extend to Victoria. Additional material which would supply data for the exact determination of the southern limit of certain species in this colony and the northern limit of some of the Victorian species is much to be desired; as also are collections from the interior of the continent, especially from anywhere outside the drainage area of the great river system of this and the adjoining colonies, and where such creeks or rivers as there are do not directly reach the sea.

NOTES AND EXHIBITS.

Mr. Froggatt read the following "Note on the occurrence of the *Icerya ægyptiacum* in New South Wales":—

"Some two months ago when collecting at Penshurst, near Sydney, I found a number of mealy white coccids upon the underside of the leaves of *Goodenia ovata*, in a paddock about a mile and a half from the railway station. These I forwarded to Mr. W. M. Maskell, of Wellington, N.Z., who immediately identified them as *Icerya ægyptiacum*, the "Egyptian mealy-bug." The species has until quite recently only been known from Alexandria and Cairo, Egypt. In 1890 Admiral Blomfield forwarded a number of specimens to the Kew Gardens, stating that he had first observed it about four years before on the leaves of a banyan tree; but that since then they had spread all over the gardens, attacking everything with the exception of a few of the tougher-leaved figs, and doing an immense amount of damage. The specimens were forwarded to Mr. J. W. Douglas, who described it under the name of *Crossotosoma ægyptiacum* (Ent. Mo. Mag. March, 1890, p. 79). The Kew Bulletin, No. 41, 1890, republished his description and gave an interesting account of this pest, which is now placed in the genus *Icerya*. A few months ago Mr. R. Newstead, of Chester, recorded it from Madras, India, having received numerous specimens from a correspondent there. Up to the present time these are the only two countries in which it was known to occur. It is therefore very remarkable that it should be found upon a native plant in an out of the way place like Penshurst; and if not endemic it is not at all clear at present how it has been introduced into Australia."

Mr. Froggatt also exhibited specimens of the *Icerya*.

Mr. A. Lea exhibited a fine collection of Coleoptera recently obtained by him at Forest Reefs, N.S.W.

Mr. Fred. Turner exhibited specimens of three plants not hitherto recorded from New South Wales, including a grass proposed to be called *Eragrostis Kennedyæ*, n.sp. from Broken Hill, of which the following is a description:—

"ERAGROSTIS KENNEDYÆ (aboriginal name 'Dendernberry').—A slender tufted perennial of about one foot, glabrous, except a few hairs at the base of the leaves. Ligula reduced to a ring of cilia. Leaves from one and a half to three or more inches long, very narrow, tapering to fine points, and continued to, but not exceeding, the inflorescence. Panicle three to four inches long, narrow, but loose, with short erect branches. Spikelets shortly pedicellate, numerous, purplish, scarcely half a line long, with two or three, rarely more, minute flowers. Outer empty glumes unequal, thin, obtuse, prominently keeled, the lateral nerves obscure or very faint. Flowering glumes imbricate, very obtuse, keeled, lateral nerves very faint. Palea glabrous, not as long as the flowering glume. Stamens usually three, with small anthers. Grain very small, obovoid, and slightly rugose.

"*Hab.*—Wonnaminta Station, near Broken Hill, New South Wales. Collected by Mrs. M. B. Kennedy."

Mr. Turner also exhibited from the Australian Alps, near Mount Kosciusko, an Epacrid (*Richea Gunnii*, Hook.) hitherto known only from Tasmania and the Victorian Alps, and a grass (*Poa saxicola*, R.Br.), previously recorded only from the summit of Mt. Wellington, Tasmania.

Mr. North sent for exhibition specimens of the parrakeets from Norfolk Island and New Zealand referred to in his paper.

Mr. Baker exhibited specimens of the *Acacia* described in the paper by Mr. Maiden and himself.

Mr. Fletcher exhibited specimens of *Grevillea parviflora*, R.Br., from Mimosa, between Wagga and Temora, from the Kanimbla Valley, Blue Mts., and from near Jervis Bay; and for comparison with them a variety from Waterfall, an addition to the flora of the County of Cumberland not provided for in Dr. Woolls' List.

Also from the Blue Mts., an *Isopogon* with simple undivided leaves, and with white glabrous flowers, and other distinctive characters which point to the probability of its being an undescribed species. He also showed a number of frogs in illustration of his paper.

Mr. Hedley exhibited the shell of a mussel, *Unio angasi*, Lea, taken alive from the stomach of a 10lb. cod caught in the Barwon River near Brewarrina by Mr. William Davies. The valves measure 2¼ by 4 inches.

Mr. Brazier exhibited *Recluzia Hargravesi*, Cox, with the shell and animal, collected by the late Mr. W. Glover, lighthouse keeper at Nelson Head; the specimens were obtained after an easterly gale at the Six-mile Beach, south of Port Stephens, in June, 1882. The original or type specimens were described in Proc. Zool. Soc., 1870, with the locality given as "found washed ashore at the mouth of the Miall River, Port Stephens," which is wrong, as they were found inside the North Head of Port Stephens, on the beach, and were collected by the abovenamed gentleman. He also showed *Scutus anatinus*, Don, with the lingual ribbon, from Little Manly; and from North Queensland specimens of a new species of *Stenothyra*, an Indian genus not previously recorded from Australia.

Mr. John Mitchell read the following "Note on an aboriginal kitchen-midden at Bellambi, Illawarra":—

"While on a visit to Bellambi in July, 1892, my attention was drawn to a series of shell-mounds. A cursory glance at them on that occasion led me to conclude that they formed the remnants of a raised beach. Closer inspection, however, in July of the present year revealed their true character to be either one large kitchen-midden or several small ones close to each other. Some of the mounds have the appearance of a mass of commingled shells and sand; but experiments proved that the shells on the sides form only a thin coating, and have slidden from the top, which is formed of a considerable layer of shelly débris.

"Having discovered the shells were not distributed through the sandy mass, it became evident to me that the mounds had no connection with a raised beach; and I determined to make a careful examination to ascertain their real nature. In this examination I was ably assisted by my friends Messrs. John and Isaac Scobie. One afternoon's search resulted in the discovery of four stone tomahawks, a large number of flints, and some fragmentary bones, and ashes, intermixed with the shelly mass.

"Further exploration was continued by my friends by trenching across the mounds; in this way more tomahawks and flints were found, and, more interesting still, several oblong spaces seven feet in length by two feet in width enclosed by stones. They took these spaces to mark out the sites of graves, and sank down a depth of five feet in search of remains, but failed to find any. As the sinking in this sand would be very easy, the distance sunk is insufficient test, and I hope to make a fuller examination in this direction in the near future.

"The shells, consisting as they do almost exclusively of the larger kinds which were in common use among the aborigines as food, the presence of so many tomahawks and flints, bones and ashes, together with the superficial nature of the shell-deposit, distinctly prove these shell-heaps to be kitchen-middens.

"*The Weapons and Implements.*—Grouping the tomahawks according to Mr. Etheridge's* divisions, they include representatives of the following types—oblong-ovate, oval, and gad-shaped. Those of the oblong-ovate form are the heaviest and are of very rude manufacture; they appear to have been used without a haft. The gad-shaped specimen shows the best finish. Most of them show signs of long exposure to the weather. One is remarkably small and weighs only eight ounces. Some of them have been made from green diorite pebbles, one from a dark schistose fragment, and the petrological character of others I have not been able to determine.

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* Notes on Australian Stone Weapons and Implements, P.L.S.N.S.W. Vol. vi. (2) Pt. 3, 1891.

"The flints consisted of large pebbles and chips. One or two of the latter have artificial edges. These flints appear to me to have been used as knives by the aborigines, and in most cases the natural edge satisfied the workman. To a large extent the silicified wood so abundant in the coal measures of the district have supplied the material.

"*Position, &c.*—These shell-heaps lie between Bellambi Point and the Bellambi Lagoon, on the south side of the Bellambi jetties. They are about twenty-five feet above high water, and rest on an ancient dune which has and is still suffering rapid deportation by the wind.

"*Some Remarks on the Bearing of the Foregoing on certain Theories relating to Raised Beaches on our eastern coast.*—Shell-mounds on the Illawarra coast have been referred to by several geologists* as remnants of raised beaches, and have been cited by them as evidence of a recent elevation of the eastern coast. Professor Dana makes particular reference to a low ridge stretching between Bulli and Wollongong, standing some twenty-five feet above sea-level. Our kitchen-midden forms a part of this ridge, and in all probability one of the parts inspected cursorily by Dana and accepted by him to have been a true littoral deposit.

"It is therefore plain that in proving the Bellambi shell-heaps to be kitchen-midden remnants, the value of any of those shell-heaps along this part of our coast as evidence in support of the elevation of our coast in recent times is greatly discounted.

"At the present time in the neighbourhood of the Bellambi midden the sea is actually advancing on the present shore, as is shown by the following:—(1) The midden now lies only a few yards from the present shore, in such an exposed position as to render it wholly unfitted for the site of a kitchen-midden. (2) On and near the site of the midden I saw decayed trunks and stumps of trees (the latter *in situ*) of considerable size, that could not have grown in this exposed position so near the sea. Both the users of the midden and the trees must have had shelter from the sea-breezes and gales. That shelter could only have been afforded by a greater stretch of land clothed with hardy shrubs, lying to the seaward of the midden, than there is at present. This recession of the shore line is not in my opinion owing to any alteration of the sea-level; but, in consequence of the destruction of the vegetation in this neighbourhood, the wind has largely and is still deporting this sand dune, and so has allowed the sea to regain an area which it had formerly yielded to the land."*

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* *Vide* "Raised Beaches of the Hunter River Delta," David and Etheridge, Records of the Geological Survey of N. S. W., Vol. ii. part 2, 1890.

Mr. Mitchell also exhibited several stone tomahawks and flints which, together with some fragmentary bones and ashes, were exhumed from the midden in question; also the fossils referred to in his Note read at the last Meeting of the Society, when he was unable to be present.

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* From a more recent examination of the Bellambi middens I conclude that the stone heaps, referred to above as probably indicating the sites of graves, are old ovens, as suggested by Mr. Froggatt at the time my note was read.

WEDNESDAY, MARCH 28TH, 1894.

ANNUAL GENERAL MEETING.

The President, Professor David, B.A., F.G.S., in the Chair.

Messrs. W. R. Morgan, J. Nisbet, W. F. Smeeth, and Captain Shuttleworth were introduced as visitors.

The Minutes of the last Annual Meeting were read and confirmed.

PRESIDENT'S ADDRESS.

The Society has now completed the nineteenth year of its existence, and in conformity with the custom followed by my predecessors in this office, I propose first to review the history of the Society during the past year. I shall then give a short summary of the present state of our knowledge of the geology of Australasia during the greater part of the Palæozoic Era.

During the Session of 1893, the full number of Monthly Meetings (nine) was held, at which forty-eight papers were read, showing that the Society is maintaining its reputation for work and progress.

The special efforts made to finish the Macleay Memorial Volume necessitated keeping back the publication of Parts ii.-iv. of the Proceedings for 1893. The delay so occasioned has been increased through the printer's being fully occupied with the usual rush of work about Christmas time, and by the time required for the preparation of the plates to illustrate the Parts in question. Matters now, however, have so far progressed that the remaining Parts will be ready for issue at no very distant dates.

As nine ordinary monthly meetings now make up a session, the Council has decided that the Proceedings for the year shall, under ordinary circumstances, and as far as possible, take the form of three bi-monthly and one quarterly part. It is hoped, therefore, that as soon as the arrears into which the issue of the Proceedings has of late fallen, firstly, through the necessity for carrying on simultaneously for about eighteen months the publication of both the Memorial Volume and the Proceedings, and secondly, through the subsequent setting aside of the latter to allow of the completion and issue of the former, have been worked off, that the majority of the Parts will in future be issued at shorter intervals than has been possible in the past, but otherwise with the same commendable regularity, and with as little unavoidable delay as possible.

The attendance at the meetings, all things considered, has been quite up to the average. The Ocean-street Tramway, to be opened for traffic in the course of the next few months, will make the Society's Hall much more conveniently accessible than formerly to the bulk of the members; and it is not too much to expect that the usefulness and prospects of the Society will be proportionally benefited in consequence.

Eleven new members and two corresponding members have been elected. It will be remembered that a year ago a new rule relating to the amount of subscription was passed, and which for a number of members takes effect from the commencement of 1894. It may be well to remind the members of the Society that in common with Governments, Corporations, and individuals, the Society has to cope with a reduced income by reason of the widespread commercial depression now prevailing in the colonies; that chiefly due to the same cause, and partly due to the passing away of old members, there has been a falling off in point of numbers, so that at present the number of effective members on the books is smaller than usual; and that though the course adopted will no doubt at first, but it is hoped only temporarily, result in some loss of revenue, it was felt that, in view of Sir William Macleay's liberality to the Society, it was a wise course to take in the interests of the welfare of Science, and of an extension of the Society's sphere of usefulness.

Two resignations have been received, and Mr. E. C. Merewether, one of our members, has been removed by death. Mr. Merewether was a foundation member of this Society. He arrived in the colony in 1838, as A.D.C. to Sir George Gipps, and was afterwards A.D.C. and Private Secretary to Sir Charles Fitzroy, and Sir William Denison. On relinquishing this last position, he was appointed Commissioner for Crown Lands and Goldfields in the New England District. Subsequently he held the post of Clerk to the Executive Council, and in 1859 was entrusted with a mission to the British Government from the Government here. On his return in 1860 he took the general superintendentship of the business of the Australian Agricultural Company at Newcastle, which he retained for about 16 years. He occupied the position of President of the N. S. Wales branch of the Royal Geographical Society of Australasia, and was always deeply interested in the progress of geographical science.

Death has also removed during the past year one who, though not a member of our Society, deserves special recognition by us on account of his long and useful life devoted largely to the study of Natural Science. Dr. George Bennett was born at Plymouth in 1804 and lived to the advanced age of 89. His connection with Australia dates back for nearly 70 years. At the early age of 15 he made a voyage to Ceylon, and on his return to England devoted himself to the study of medicine. After taking the degree of M.R.C.S. he gratified his desire of seeing the world by becoming surgeon of a vessel sent out on an exploring expedition. It was during this voyage that the Doctor visited Australia and began his observations on its peculiar mammalia. In 1832 he re-visited this country in order to investigate further the habits and anatomy of the Monotremata, as well as other features of our natural history. His travels extended to Java, Singapore and China, and on his return to England he published the results of his researches in a volume entitled "Wanderings in N. S. Wales, Batavia, Pedir Coast, Singapore and China, being a Journal of a

Naturalist in these Countries during 1832-4." This volume was issued in London in 1834, and during the same year "Notes on the Natural History and Habits of the Ornithorhynchus paradoxus," was also published. Amongst the other works written by Dr. Bennett may be mentioned "Gatherings of a Naturalist in Australasia" (1860); "Acclimatisation: its eminent adaptation to Australia" (1862); "A trip to Queensland in search of fossils" (1871); and a pamphlet on "The Introduction, Cultivation, and Economic Uses of the Orange and Others of the Citron Tribe," published in Sydney in 1871.

In 1836 Dr. Bennett finally determined to settle in N. S. Wales, and began a successful career as a medical man. Although he soon secured a large practice, the doctor still devoted much time to his scientific work, which obtained world-wide recognition; and for fifty years he kept up a constant correspondence with Sir Richard Owen, who was his college companion and intimate friend. Darwin was also among the deceased doctor's friends, and Darwin's methods of investigation were closely followed by him. In 1859 Dr. Bennett became an F.R.C.S. and an M.D. of Glasgow University.

From the time of his arrival in Sydney he took the keenest interest in our Botanic Gardens, and did much to advance them towards their present state of perfection. He was one of the chief founders of the Australian Museum; he acted for some time as its secretary, and afterwards became one of the Board of management. The now defunct Acclimatisation Society owed much to his friendly aid, and he was also one of the Vice-Presidents of the Zoological Society. During the whole of his residence in the colony he kept up an active scientific correspondence with friends at home, particularly with the Linnean Society, of which he was one of the oldest members. On the 11th of December, 1889, the Council of the Royal Soc. of N.S.W. awarded him the Clarke Medal for 1890, in recognition of his meritorious scientific labours, and more particularly on account of his very valuable contributions to the Natural History of N. S. Wales.

The library is steadily increasing in importance by additions—during the past year for the most part received in the way of exchanges. Societies in Europe and America which, more particularly of late, have adopted the plan of sending their publications by post, and in some cases have asked that our despatches may be sent through the same channel, are requested to note that though New South Wales is nominally a member of the Postal Union, yet for some occult reason* the rates chargeable on postal matter other than letters leaving the colonies for transmission to Europe and America are higher—by as much as fifty or one hundred per cent.—than on those which reach us from the countries mentioned.

The event of the year has of course been the issue of the Macleay Memorial Volume.

The editorship of this work has been undertaken by our Secretary, Mr. J. J. Fletcher, M.A., B.Sc., and carried out in a manner which merits the highest praise. The idea so happily conceived by our late President, Professor Haswell, of gathering together an *opus magnum* of recent research in Natural Science to commemorate the founder of our Society has been carried into execution with eminent success, and the ready response to the appeal to the most eminent scientific authorities in Australasia to contribute papers was proof in itself of how widespread throughout Australasia was the appreciation of the work which Sir William Macleay had done to advance Natural Science in all its branches.

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* Thus subsequently officially explained: "This colony does come within the Postal Union; also the minimum rate of postage fixed by article 5 of the Vienna Convention for printed matter is ½d. per 2oz.; but union countries have the right when such correspondence is conveyed by sea for a distance of over 300 miles, and is subject to a charge for such conveyance, to levy a postage not exceeding a penny per 2oz. Great Britain and the United States of America, as well as a number of other union countries, levy the minimum rate of postage, whilst New South Wales and all the other Australasian colonies (excepting Fiji and New Zealand) levy the maximum rate of postage to protect their revenues from loss; hence the difference in the postage pointed out."

As regards the work done at the Museums during the last year Mr. J. H. Maiden has kindly furnished me with the following note relating to the Technological Museum :—

"The Technological Museum, housed in temporary premises in the Outer Domain since the destruction of its former collections in 1882 in the Garden Palace fire, has during the year removed into a spacious and handsome building erected in Harris Street at a cost of £20,000. The specimens, which number about 35,000, are arranged on three main floors, which are divided transversely by numerous brick partitions, thus enabling classification to be readily carried out. Provision has been made in the building for workshops, laboratories, and offices. The removal and rearrangement of the specimens have left the Curator and his staff very little time for original work during the year, but some contributions have nevertheless been made to the Proceedings of the Linnean Society by the Curator (Mr. J. H. Maiden), the Assistant Curator (Mr. R. T. Baker), and Mr. W. W. Froggatt. Another member of the staff (Mr. H. G. Smith) read a paper before the Royal Society of N.S.W. on the 'Occurrence of Evansite in Tasmania,' while Mr. Maiden read a paper, by invitation, before the Sydney Architectural Association, on 'Ironbarks,' in which he endeavoured to make clear the characteristics, the properties, and the geographical distribution of each of these interesting species of *Eucalyptus*, which are usually difficult to discriminate."

At the Australian Museum during the past year the work of the Museum staff has been mainly connected with the care of the Collections. Preparations are being made as opportunity offers for the contemplated new work on the Snakes of Australia. Two numbers of the "Records" have been issued (Vol. ii. Nos. 4 and 5). Since the suspension of the "Records" some papers emanating from the Museum have been contributed to the Linnean Society. Other publications have been—Part 3 of the Catalogue of Marine Shells of Australia and Tasmania: The *Muricidæ*, by J. Brazier; Part 4 of the continuation of Scott's Australian Lepidoptera, by A. S. Olliff and Mrs. Ford; and a Catalogue of the pamphlets in the Museum Library.

At the Macleay Museum, at the University of Sydney, Mr. George Masters, the Curator, has cleaned and sorted a large number of specimens of Australasian, &c., insects in the fine collection at the Museum, which is available for Members of the Linnean Society and for all students of Natural History.

At the Department of Mines the Curator of the Geological Museum, Mr. G. W. Card, has been engaged of late principally in the removal of the collections of rocks, minerals, and fossils from the old Museum at the Department of Mines to the building in the Domain formerly occupied by the Technological Museum Collections.

The following are a few notes relating to scientific work other than that done at the Museums:—

During the September Vacation a biological expedition was organised by Professor Haswell to Jervis Bay, where a supply of material was obtained for the investigation of the development of the Port Jackson shark, *Cestracion.* The original work done during last year at the Biological Laboratory at the University related chiefly to the tape-worm larva *(Polycercus)* found in the "squirting earthworm" of the scrubs of Illawarra and the Blue Mountains. Dr. Martin's important researches at the Physiological Laboratory at the University Medical School on the effects of snake poison necessitated his further investigating the phenomena of the clotting of the blood, and he has contributed two valuable papers on this subject during the past year to the Journal of Physiology.* †

The issue of a new geological map of New South Wales prepared by Mr. E. F. Pittman, the Government Geologist, and published last year by the Department of Mines, is an important event in the annals of Australian geology. The map is a great advance on its predecessors, and presents a harmony of colour and clearness of delineation which make it at once artistic and intelligible.

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* "Does the non-coagulable Blood obtained by Injections of Wooldridge's Tissue Fibrinogen (Nucleo-Albumens) contain Peptone or Albumoses?" by C. J. Martin, M.B., B.Sc., Journal of Physiology, Vol. xv. No. 4, 1893, pp. 375-379.

† "On some Effects upon the Blood produced by the Injection of the Venom of the Australian Black Snake *(Pseudechis porphyriacus)*," *ibid.*, Vol. xv. No. 5, 1893, pp. 380-400.

The paper by Professor Tate and Mr. J. T. Dennant, "On a Correlation of the Marine Tertiaries of Victoria and South Australia," contains much new material, and has quite reconstructed the classification previously adopted for those formations. The Records of the Geological Survey of N. S. Wales, published by the Department of Mines last year, give an account of nearly all the additions made to our knowledge of the geology of New South Wales during 1893. Two very useful papers for reference purposes deserve special notice: "The Australian Geological Record for the year 1892, with addenda for the year 1891," by R. Etheridge, Junr., Palæontologist and Librarian, and W. S. Dun, Assistant Palæontologist and Librarian*; and "A Locality Index to the Reports of the Geological Survey of N. S. Wales, from 1875 to 1892 inclusive," by W. S. Dun, Assistant Palæontologist and Librarian.†

It is to be hoped that these authors may continue to follow this good precedent during this and succeeding years.

The special subject of this address is a sketch of our present knowledge of the Geological History of Australia, Tasmania and New Zealand from Archæan Time down to the commencement of the Permo-Carboniferous Period. Special reference will be made to the folding which the earth's crust has been proved to have undergone in that portion of the Australasian Region within the above-mentioned limits of geological time.

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* Records of the Geological Survey of New South Wales, Vol. iii. Part iv. pp. 132-153.

† *Ibid.* pp. 154-194.

I. ARCHÆAN.

In Australia and Tasmania rocks have been discovered of Pre Cambrian (Archæan) Age, as old therefore, perhaps, as any rocks known in any part of the world.

In New Zealand Archæan rocks are doubtfully represented. It does not, of course, follow that the areas now occupied by these rocks are absolutely the oldest portions of the Australian Continent; they are, however, absolutely the oldest known to us.

In South Australia this group is developed (1) on a large scale on either side of St. Vincent's Gulf near Adelaide, and forms the basis of the Mt. Lofty Range.

The rocks consist of gneiss, mica schist, slates, and reddish-purple jointed micaceous shales.

Professor Tate informs me by letter that there is a conglomerate of gneissic pebbles in mica schist six to ten feet thick on the north coast of Kangaroo Island and elsewhere. He also states that graphite occurs in the Archæan rocks of the St. Vincent's Gulf area, and that ilmenite forms a constituent of the gneiss at Hack's Bridge, between Adelaide and Strathalbyn.

The rocks are in places remarkably free from alteration, notwithstanding their immense antiquity. It is these rocks which have been powerfully glaciated at some unknown period of geological time, as described by Professor Tate, of Adelaide University.* † ‡

Their general strike is N.E. and S.W., the dip being chiefly to S.E. at high angles, but reverse dips occur in places.

At Mt. Lofty Mr. Brown states§ that their dip is chiefly southeasterly for a distance of twenty miles.

The steeper sides of the folds face the S.E., in which direction they are bounded by a mass of granite evidently of considerable extent, though hidden for the most part under Tertiary limestones. At Ardrossan there is an immense unconformability between these

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* Trans. Roy. Soc. S. Australia, Vol. ii. p. 64.

† *Ibid.* Vol. viii. p. 49, 1886.

‡ Aust. Assoc. Adv. of Science, Vol. i. p. 231. Sydney, 1887.

§ S.A. Ann. Rep. of Govt. Geologist, 1882-83. Adelaide, 1884. p. 10.

Archæan rocks and the overlying Lower Cambrian Limestone, the Parara Limestone as figured by Mr. Otto Tepper.*

In the above section the Parara Limestone is shown dipping at an angle of only 15° off the Ardrossan marble, which dips at 59½°. In a subsequent report,† however, Mr. Tepper expresses his belief that the Ardrossan marble is probably of Cambrian Age and passes up conformably into the Lower Cambrian Parara Limestone.

No organic remains have hitherto been detected in these rocks. A specimen exhibiting a structure somewhat resembling macroscopically that of *Eozoon Canadense* was collected by Mr. C. S. Wilkinson, the late Government Geologist of New South Wales, from these Archæans, but proved on microscopic examination to differ from that supposed organism, and was certainly inorganic. The marble limestone of Ardrossan, however, is very suggestive of contemporaneous life, but it may be of Cambrian Age.

These rocks were folded on N.E. and S.W. axes before the commencement of the Lower Cambrian Age, and as both conglomerate beds and ripple marks are met with in the Archæan Group as well as in the succeeding Cambrian formation, it is almost certain that a land surface existed in the neighbourhood of Adelaide before the close of Pre-Cambrian time.

These north-easterly axes of folding can be traced from near Adelaide to Thackaringa and Broken Hill, though it is by no means certain as yet that all the rocks folded on these axes within the above limits are Archæan.

(2) The Musgrave Ranges, which in Mount Woodroffe attain an altitude of 5,120 feet, are composed of crystalline schists, gneiss and various eruptive rocks, together with considerable deposits of magnetite and titaniferous iron, but it is not stated by Mr. Brown‡ whether the last-mentioned deposits are contem-

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* Trans. Phil. Soc. Adelaide, 1878-79, pp. 76-79, pl. I.-II. Government Printer, Adelaide, 1879.

† Trans. Proc. and Report Roy. Soc. S. Australia, Vol. iv. (for 1880-81), p. 61. Adelaide, 1882.

‡ South Australia. Report on Journey from Warrina to the Musgrave Ranges. H. Y. L. Brown. By authority. Adelaide, 1890. p. 2.

poraneous or subsequent. These rocks are perhaps on the same horizon as the Archæans of the Macdonnell Ranges about to be described.

(3) In the Macdonnell Ranges on the upper part of the Finke River micaceous and hornblende schists, dolomite and crystalline limestone, and gneissic and granitic rocks have been provisionally referred by Mr. Brown* to Archæan time, on the ground that they are strongly unconformable to the overlying formation, and the latter is in turn capped unconformably by a series of rocks, the age of which has lately been proved to be Lower Silurian.

These Archæan rocks were strongly folded along E. and W. axes previous to the deposition of the overlying Cambrian rocks. No conglomerates nor ripple-marks are recorded in the Cambrian rocks, so there is no absolute proof that the Macdonnell Ranges were a land surface in Pre-Cambrian time. It is certain, however, that as proved by the immense beds of altered sandstone in the neighbouring Cambrian rocks that land could not have been very far distant, or, at any rate, if there was no land, the ocean there must have been very shallow.

(4) In West Australia, Mr. H. P. Woodward,† the Government Geologist, has identified certain rocks as Archæan in the Kimberley District, as he considers them older than the Lower Cambrian of that locality, characterised by *Salterella* and *Olenellus*.

These rocks are of a schistose and gneissic character, and extend from near the Denham River to Mount Dockrell, forming the Mueller Range, a little further west, and striking in a N.W. direction through the King Leopold Range to King's Sound.

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* South Australia. Report of Geological Examination of the country in the neighbourhood of Alice Springs, by H. Y. L. Brown. By authority. Adelaide, 1890.

And also—Further Geological Examination of Leigh's Creek and Hergott Districts, and General Geology on the Finke River, by H. Y. L. Brown. By authority. Adelaide, 1892.

† Report on the Goldfields of the Kimberley District by H. P. Woodward. By authority. Perth, 1891. p. 10.

This belt of metamorphic rocks is from 10 to 30 miles wide as described by the late Mr. Hardman*, and at least 120 miles in length.

Mr. Hardman describes† the metamorphic rocks of part of the Kimberley District as consisting of mica-schist, andalusite schist, epidote rock, chlorite schist and talcose schist, and at Bald Rock, one mile N.E. of Mount Philip, he mentions a pink granite containing much olivine, a truly remarkable rock, if the description of it be correct. Its relation to the Archæan (?) rocks of that district is not known.

As for as I can gather, no actual junction line has as yet been observed between the Archæan rocks and the *Olenellus* and *Salterella* rocks, so that the classification is provisional only, as the schistose and gneissic rocks may represent portion of the Cambrian rocks highly metamorphosed. That there should be Archæan rocks, however, in a district where there is a considerable development of fossiliferous Lower Cambrian rocks associated with a highly metamorphic series is more than probable.

At the Kimberley District, therefore, there must have been either land or shallow ocean in Pre-Cambrian time.

(5) In Tasmania certain rocks on the west coast and in the north and north-east portions have been described by Mr. R. M. Johnston, F.G.S.‡, &c., as being probably of Pre-Cambrian Age on the evidence of an apparently strong unconformity between them and the rocks of the Upper Cambrian Series in the Mersey District of that island.

The rocks consist of quartzites, tourmaline quartzites, sandstone, conglomerate, mica-schist, chlorite schist, gneiss, crystalline granular amphibolite, granite, topaz-porphyry, diallage rock and serpentine, with massive deposits of hæmatite and magnetite. In the Meredith Range limestone is mentioned* as forming the uppermost member of the Archæan Series.

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* Report on the geology of the Kimberley District, Western Australia, by Edward T. Hardman, F.R.G.S.I., Assoc. Roy. Coll. Science, Dublin. By authority. Perth, 1884, p. 21.

† *Loc. cit.* p. 10.

‡ Geology of Tasmania, by R. M. Johnston, F.G.S., &c., pp. 16-32. By authority. Hobart, 1888.

The eruptive rocks are not necessarily contemporaneous with the metamorphosed sediments, and the iron ore deposits occur as true mineral lodes near Yorktown,† and rest on a floor of serpentine. The presence of from three to five per cent. of chromium sesquioxide in the Yorktown iron ore shows that the ore has probably been derived from the serpentine. The iron ore deposits are probably, therefore, of later origin than the Archæan rocks, and not contemporaneous like those of the Archæan region of North America.

The limestone, however, if its age be truly Archæan, of course implies the probable contemporaneity of animal or plant life as does the dolomite and limestone of the Macdonnell Ranges of South Australia.

Their thickness has not yet been calculated. Their general strike is N. 25· W., and they are foliated, the folia dipping generally at steep angles. As the Cambrian rocks of the Mersey District are not foliated but simply steeply inclined and folded, it is probable that the Tasmanian Archæans were disturbed and thrown into folds before the Upper Cambrian strata were laid down.

(6) In New Zealand the crystalline and foliated schists of the Southern Island may be in part Archæan. In the Otago District they cover an area of 8000 square miles, and are considered by Sir James Hector‡ to be chiefly altered Silurian or even Carboniferous rocks.

Sir James Hector states§ that in the Nelson and Westland Districts granites occur of Pre-Silurian Age. They may, of course, be Cambrian instead of Pre-Cambrian, and cannot therefore at present be classed as Archæan.

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* *Loc. cit.* p. 20.

† f. Gould, quoted by Johnston, *loc. cit.* p. 27 onwards.

‡ Indian and Colonial Exhibition, London, 1886, New Zealand Court. Detailed Catalogue and Guide to the Geological Exhibits, by Sir James Hector, F.R.S. By authority. Wellington, 1886.

§ *Loc. cit.* p. 85.

As shown on Sir James Hector's Section* the metamorphic schists near Collingwood, at the north-west end of the South Island, are strongly uncomformable to the overlying Lower Silurian rocks.

Captain F. W. Hutton, F.R.S., in his excellent paper on the Geology of New Zealand,† classes as Archæan the bulk of the crystalline and foliated schists already referred to by Sir James Hector, calling them the Manapoúri System. The rocks consist of "grey and red gneiss, garnet-bearing schist, hornblende schist, mica schist, quartz schist, and occasionally granular limestone. Scales of graphite have been found in the mica-schist at Dusky Sound." Eastwards the Series is bounded in Otago by the great Te Anau Fault, which has an immense downthrow to the east, and strikes north and south.

In the Riwaka Mountains Captain Hutton shows on his Section‡ a strong unconformability between the rocks classed as Archæan and those of the Aorere Series classed as Ordovician.

With regard to the thickness of the Archæan rocks in Otago, Captain Hutton states§:—"We can only escape from the conclusion that these rocks have a thickness of many miles by supposing either that the plane of foliation does not always coincide with the original plane of bedding, or that a series of reverse folds occur, neither of which has as yet been proved."

I believe Captain Hutton has subsequently obtained evidence which has led him to modify this opinion, and he now considers a large portion, at all events, of these crystalline rocks to be intrusive rocks with a superinduced foliation.

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* *Loc. cit.* p. 82.

† Geology of New Zealand. By Captain F. W. Hutton, F.G S., Professor of Biology in the Canterbury College University of New Zealand.
Q.J.G.S. for May, 1885, pp. 194 and 198.

‡ *Loc. cit.* p. 200.

§ *Loc. cit.* p. 198.

In the Otago District the folia have an almost constant dip to the west at from 45° to 80°. Northwards from the Otago District to Tasman's Bay at the north end of the South Island, their strike, as far as can be judged from the Geological map, is approximately parallel with the principal axis of the South Island, that is S.W. and N.E.

It may be concluded that in the South Island of New Zealand there is a thick series of crystalline rocks partly eruptive partly metamorphic, which in places, as near Collingwood, are strongly unconformable to the overlying Lower Silurian rocks, and such portions of them, therefore, must be Pre-Silurian, and therefore either Cambrian or Pre-Cambrian, probably chiefly the latter in view of their extreme regional metamorphism, as compared with the comparatively slight alteration of the Lower Silurian (Ordovician) rocks in their neighbourhood. There is no evidence to show that any portion of New Zealand was a land area in Pre-Cambrian time.

Summary of Archæan Group.—The total superficial area at present known to be occupied by Archæan rocks in Australia perhaps does not exceed about 20,000 square miles (about $\frac{1}{147}$ of its whole area). This estimate is only very approximate, and subsequent explorations may necessitate its being considerably increased. In New Zealand the crystalline schists have an area of 8,000 square miles, but only a small portion of this, if any, may prove to be Archæan. In Tasmania no data are available for calculating even approximately the area of the Archæan rocks. In Victoria, New South Wales, Queensland and the Northern Territory of South Australia no Archæan rocks have as yet been proved to exist, though hereafter it is possible that some of the crystalline schists known to be developed in those portions of the Australian Continent may have to be referred to the Pre-Cambrian Group.

The Australasian Archæan rocks consist of gneiss, mica schist, chlorite or talc schists, hornblende schists, quartzites, conglomerates, micaceous red mudstones, marble limestone, hæmatite, ilmenite, and graphite.

In the Mount Macdonnell Ranges the Archæan rocks attain an altitude of from 3000 feet up to 4000 feet, and possibly 5000 feet, at Mount Woodroffe, in the Musgrave Ranges.

Their thickness has nowhere been accurately measured in the Australasian region, but, as I am verbally informed by Professor Ralph Tate, it is very vast near Adelaide, perhaps as much as 50,000 feet.

The marble at Ardrossan, the thickness of which is said to be considerable (to judge from Mr. Otto Tepper's sections,* it appears to be not less than 100 feet), is of special interest, the immense unconformability between it [together with the conformable (?) Parara limestones, containing abundant fragments of *Archæocyathinæ*, *Olenellus Pritchardi*, and *Salterella planoconvexa*] and the underlying rocks proving the age of the latter to be undoubtedly Archæan. The marble of the Macdonnell Ranges, the limestone in the Archæan rocks of Tasmania, and the graphite associated with the Archæan rocks of S. Australia are very suggestive of contemporaneous animal or plant life.

The scales of graphite recorded by Captain Hutton† as occurring in the mica schist of Duskey Sound, New Zealand, might also be taken as evidence of probable contemporaneous life in Archæan time, but, as has been shown, it is not yet certain that those schists are truly Archæan.

That the movements of the earth's crust, which laid the foundations of the Australian Continent, commenced in Pre-Cambrian time is conclusively proved by the vast amount of folding to which the Archæan rocks at Ardrossan and in the Mount Macdonnell Ranges were subjected before the deposition of the earliest Cambrian sediments.

In Tasmania the crumpling of the crust took place between E.N.E. and W.S.W. directions, so that the axes of the folds trend N.N.W. and S.S.E.

At St. Vincent's Gulf, near Adelaide, the folds run chiefly N.E. and S.W., and N.N.E. and S.S.W., so as to meet, if produced, a prolongation of the Tasmanian axes towards the N.W., nearly at right angles. In the Macdonnell and Musgrave Ranges the trend is E. and W., and in the Kimberley District of West Australia N.W. and S.E., with a secondary folding S.W. and N.E.

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* *Loc. cit.* pl. II. between pp. 80 and 81.

† *Loc. cit.* p. 198.

It is not certain whether, either in Australia or Tasmania, there was any land surface in Archæan time, but the conglomerates in the Archæan and in the succeeding Cambrian, and the ripple-marked flaggy quartzites (if they are Archæan or Cambrian and not Lower Silurian) imply shallow seas, with probably a neighbouring land surface. It is improbable, too, that the Archæan strata should have been as powerfully folded, as observation shows them to have been, in Pre-Cambrian time, without some areas being elevated sufficiently to form land.

In Australia, therefore, there was probably land and probably contemporaneous life, at all events in the seas, in Pre-Cambrian time, the latter assumption being rendered probable by the occurrence of the beds of limestone and contemporaneous (?) iron ores and graphite in the Archæan rocks of South Australia, and of limestone and contemporaneous (?) ironstone in the Archæan rocks of Tasmania, and also by the great diversity of forms of animal life met with in the succeeding Lower Cambrian rocks.

II. CAMBRIAN.

In South Australia Lower Cambrian rocks are now known to exist at (1) Ardrossan, Parara, and Curramulka, in Yorke's Peninsula, on the west side of St. Vincent's Gulf, Wirrialpa, Blinman, Kanaka, Parachillna, and near the Ajax Mine between Beltana and Leigh's Creek over 300 miles north of Adelaide.

In the type district at Parara and Ardrossan in Yorke's Peninsula the Cambrian rocks, as described by Mr. Tepper, consist in descending order of the Ardrossan sandstone showing false bedding* occasionally coarse, and even passing into conglomerate. Beneath it lie a variegated and dark limestone and white and yellow marbles, dipping S. 27° E. at 15°. Below the marbles is a light coloured and variegated siliceous rock (f. Tepper) resting perhaps conformably on Ardrossan marble.

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* *Loc. cit.* p. 76.

Judging from Mr. Tepper's section their thicknesses are as follows :—

Ardrossan sandstone	15 feet
Parara limestone	40 feet
Siliceous rock	18 feet

In the Mount Lofty Ranges is a vast thickness of rock, the exact horizon of which has not yet been determined. Mr. R. Ethridge, junr., informs me that he considers a portion of this at any rate to be Cambrian.

Mr. H. Y. L. Brown* describes these rocks as consisting of two series, the lower composed of quartzites, sandstones, clay shales, and conglomerates, the last-mentioned at Sturt's Creek, containing pebbles of granite and quartzite, and the upper of crystalline limestones, flaggy ripple-marked quartzites and sandstones, and massive quartzite. The upper series may possibly be Lower Silurian, though Mr. Brown does not mention any unconformability between them. Near Parachillna and at the Blinman Mine, to the South of Leigh's Creek, and about 260 miles northerly from Adelaide, quartzites, claystones, conglomerates, dolomite, and limestone have been described by Mr. Brown.† These rocks have been strongly folded, the axes trending W.N.W. and E.S.E.

Representatives of the oldest known fauna of Australia are met with in the Cambrian rocks of Yorke's Peninsula above referred to. They have been described by Professor Tate, Mr. H. Woodward, Mr. R. Etheridge, Junr., and Mr. Howchin. The following have been recorded by Professor Tate in his succinct account of the Cambrian Fossils of South Australia.‡ The extreme interest which attaches to this the oldest known fauna of Australia is my excuse for quoting at length from this paper.

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* South Australia. Annual Report of the Government Geologist, Dec. 1st, 1882, to Dec. 31st, 1883, p. 10.

† South Australia. Report on the gold-bearing area in the neighbourhood of Leigh's Creek. By authority. Adelaide, 1891, p. 1.

‡ Trans. Roy. Soc. South Australia, 1892, pp. 183-189.

FORAMINIFERA (?).—*Girvanella* sp., R. Etheridge, Junr., Trans. Roy. Soc. South Australia, Vol. xiii. p. 19, tab. II. fig. 8.

SPONGIDA.—*Hyalostelia* sp., W. Howchin, F.G.S., Trans. Roy. Soc. South Australia, 1892, pp. 188-189.

ZOANTHARIA (?).—*Protopharetra (?) Scoulari*, R. Etheridge, Junr., Trans. Roy. Soc. South Australia, Vol. xiii. p. 18, t. ii. figs. 5-7, 1890.

Ethmophyllum Hindei, R. Etheridge, Junr., *loc. cit.* p. 14, t. ii. figs. 1-4 ; t. iii. figs. 9, 10.

Coscinocyathus Tatei, R. Etheridge, Junr., *loc. cit.* p. 17, t. iii. figs. 3-5 (*non* figs. 1, 2, and 6-8).

Coscinocyathus (?) Etheridgei, spec. nov., Tate, *loc. cit.* p. 188.

ENTOMOSTRACA.—*Leperditia* spp.

TRILOBITA.—*Dolichometopus Tatei*, H. Woodward, Geol. Mag. Aug. 1884, t. XI. fig. 3, p. 343.

Conocephalites australis, H. Woodward, *loc. cit.* t. XI. figs. 2a, 2b.

Olenellus (?) Pritchardi, spec. nov., Tate, *loc. cit.* p. 187, pl. II. fig. 11.

Microdiscus subsagittatus, spec. nov., Tate, *loc. cit.* p. 187, pl. II. fig. 12.

Gen. (?), sp. (?), Tate, *loc. cit.* p. 187, pl. II. figs. 9 and 13.

BRACHIOPODA.—*Orthisina compta*, spec. nov., Tate, *loc. cit.* p. 185, pl. II. figs. 6-6a.

Orthis (?) peculiaris, spec. nov., Tate, *loc. cit.* p. 185, pl. II. fig. 5.

LAMELLIBRANCHIATA.—*Ambonychia macroptera*, spec. nov., Tate, *loc. cit.* p. 185, pl. II. fig. 10.

GASTROPODA.—*Stenotheca rugosa*, Hall, var. *paupera*, Shaler and Foerste, Tate, *loc. cit.* p. 183, pl. II. fig. 4.

Ophileta subangulata, spec. nov., Tate, *loc. cit.* p. 184, pl. II. figs. 8a-8b.

Platyceras Etheridgei, spec. nov., Tate, *loc. cit.* p. 184, pl. II. figs. 7a-7c.

PTEROPODA.—*Salterella planoconvexa*, spec. nov., Tate, *loc. cit.* p. 186, pl. II. figs. 3-3b.

Salterella sp., Tate, Trans. Roy. Soc. South Australia, 1890, p. 249.

Hyolithes communis, Billings; Tate, *loc. cit.* p. 186, pl. II. fig. 2.

Hyolithes conularioides, spec. nov., Tate, *loc. cit.* p. 186, pl. II. figs. 1-1a.

This list of the Lower Cambrian fauna of Australia might be completed by the addition of *Salterella Hardmani* and *Olenellus Forresti*, both from the Lower Cambrian rocks of the Kimberley District of West Australia.*

Professor Tate states† that no less than twenty-three determinable species from the Lower Cambrian rocks of Australia have been elaborated, and four or five additional ones are represented by forms too obscure for description.

Of the seven sub-kingdoms of the animal kingdom therefore (if *Girvanella* be referred to the Foraminifera and the *Archæocyathinæ* to the corals), no less than five sub-kingdoms are represented, the Echinodermata, and the Vertebrata alone being unrepresented.

(2) At the Macdonnell Ranges, in Central South Australia, quartzites, conglomerates, dolomitic limestone, limestone, sandstone and slate have been described by Mr. Brown‡ § as resting unconformably on the Archæan series, and being capped unconformably by Lower Silurian strata. No fossils have hitherto been found in these Pre-Silurian rocks.

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* Geol. Mag. No. 309, New Series, Dec. III. Vol. vii. No. iii.; Notes on the Palæontology of Western Australia, by Dr. H. Woodward, F.R.S., and A. H. Foord, F.G.S., pp. 98-100, pl. IV. figs. 1, 1a, 1b, and 2, 2a, 2b.

† *Loc. cit.* p. 183.

‡ South Australia. Report on the Coal-bearing area in the neighbourhood of Leigh's Creek, by H. Y. L. Brown. By authority. Adelaide, 1891, p. 13.

§ South Australia. Further Geological Examinations of Leigh's Creek and Hergott Districts. H. Y. L. Brown. By authority. Adelaide, 1892, p. 7.

They have been strongly folded along persistent east and west axes, and are vertical in places.

(3) In the Kimberley District of West Australia the Cambrian rocks are described by Mr. H. P. Woodward* as forming a belt, which strikes N.E. and S.W. from the Burt Range to the southward of Mt. Dockrell. They consist of crystalline limestones, sandstones, grits, quartzites, clay slates and sandy flags.

The principal gold deposits have been discovered in this formation, which, as already stated, contains *Salterella Hardmani* and *Olenellus Forresti.*

(4) In Tasmania a considerable thickness of rocks has been classed by Mr. R. M. Johnston† and others as Cambrian. They are probably Upper Cambrian. He divides them into three groups, arranged in the following descending order:—

(a) Primordial Calciferous Group. Limestones of the Chudleigh, Belvoir, Ilfracombe, &c.

(b) Magog Group. Sandstones and alum schists of Chudleigh, Magog Range, &c.

(c) Dikellocephalus Group of Caroline Creek, near Latrobe.

The latter group alone has yielded fossils. It consists of rusty quartzites with abundant casts of fossils, micaceous purple clay slates and breccias, and purplish-grey quartzites.

At Caroline Creek I observed the dip to be about S.W. at 33°.

Mr. Johnston gives‡ the general dip in the same locality as E. 30° N. at 45°. Mr. Gould states that the general dip is northerly, differing from that of the neighbouring Archæan schists, whose strike is generally West of North.

As far as my own limited observations extended, the general trend of the folds in this series agreed approximately with that of the Archæan Series.

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* Western Australia. Report on the Goldfields of the Kimberley District, by Harry Page Woodward. By authority. Perth, 1891, p. 10.

† Geology of Tasmania, by R. M. Johnston, F.G.S., &c. By authority. Hobart, 1888, pp. 16-32.

‡ *Loc. cit.* p. 36.

The following fossils have been recorded by Mr. R. M. Johnston*:—

ANNELIDA.—*Scolithus Tasmanicus.*

TRILOBITA.—*Conocephalites Stephensi.*
 Loganellus or *Conocephalites.*
 Bathyurus (?) sp.
 Asaphus sp.
 Dikellocephalus Tasmanicus.

BRACHIOPODA.—*Leptæna* sp.
 Orthis triangularis, (?) Sow.

LAMELLIBRANCHIATA.—Gen. ? sp. ?

GASTROPODA.—*Ophileta* spp., R. Etheridge, jun., Proc. Roy. Soc. Tasmania, 1863, t. 2, figs. 13 and 14.

PTEROPODA.—*Tentaculites* sp.

Mr. Etheridge expresses the following opinion with regard to their geological age:—

"Accepting therefore the determination of the foregoing trilobites as approximating to the truth, it appears more than probable that the age assigned to the fossils from the Caroline Creek beds by Messrs. Etheridge and Lesquereux is correct, and that this may be looked upon as that of the Lingula flags or Menevian beds of Great Britain and the Potsdam sandstone of North America."†

Summary of Cambrian Period.—The superficial area occupied by the Cambrian rocks in South and West Australia and Tasmania, and their thickness, is considerable, but has not been measured as yet.

They were laid down in seas of moderate depth, as proved by the current-bedded sandstone at Ardrossan, the beds of conglomerate at Mount Lofty and in the Macdonnell Ranges.

The ripple-marked quartzites of the Mount Lofty district, if they belong to the Cambrian rather than the Lower Silurian, also of course imply deposition in shallow water. The granite and quartzite pebbles in the conglomerate at the Sturt Creek must probably have been derived from Pre-Cambrian rocks, but no well marked basal breccia has as yet been found.

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* *Loc. cit.* pp. 33, 37, 38.

† A Description of the Remains of Trilobites from the Lower Silurian Rocks of the Mersey District, Tasmania, by R. Etheridge, Junr. Papers and Proc. Roy. Soc. Tasmania, 1882, pp. 150-163.

The fossiliferous limestones of the *Olenellus-Salterella* zone in South Australia show that the seas in Cambrian time teemed with various forms of marine animal life, all the sub-kingdoms being perhaps represented except the Echinodermata and the Vertebrata.

The Cambrian strata in the Macdonnell Ranges, where they are seen in contact with the Lower Silurian rocks, were considerably folded before the latter were formed, the axes of folding corresponding closely with those of the Archæan Group.

In Tasmania the folds run north-westerly. In South Australia at Yorke's Peninsula their trend is N.E. by E. This N.E. folding continues towards the N.E. until it meets the main axes of folding coming from Tasmania from the S.E. and trending towards the N.W. The folds, then, as they near Leigh's Creek trend north-westerly, and as they approach the Macdonnell Ranges swing round gradually to an east and west direction.

In the Kimberley district the principal axes of folding appear to run N.E. and S.W. parallel with part of the Archæan rocks in the same neighbourhood.

It must be borne in mind, however, that the principal direction of folding of the Archæan rocks at Kimberley is N.W. and S.E., but Cambrian rocks have not been identified in this particular locality, the King Leopold Range area, where the main axes of the folds of the Archæan are visible. If hereafter Cambrian rocks be found to exist there, their folds will no doubt be found to correspond with those of the Archæan rocks, as is certainly the case in the Macdonnell Ranges. The folding of the Cambrian rocks and further simultaneous folding of the Archæan rocks before the commencement of the Silurian Period must have had the effect of increasing the land area, or area of very shallow ocean. The sediments of the succeeding system the Silurian, of vast area and thickness, imply an extensive surface brought within reach of natural denuding agencies.

III. SILURIAN PERIOD.

Whereas the superficial area occupied by Cambrian rocks in Australia and Tasmania does not perhaps exceed about 10,000 square miles, or about $\frac{1}{300}$, in round numbers, of the whole combined area (2,944,600 + 24,500 = 2,969,100 square miles), the rocks which have been provisionally referred to the Silurian Period cover perhaps ten times as much area, or approximately $\frac{1}{30}$ of the whole area of Australia.*

A. LOWER SILURIAN.—Rocks of Lower Silurian Age have been identified in Tasmania, Victoria, and South Australia, and also in New Zealand.

(1) In Tasmania Mr. Johnston has described† the Lower Silurian rocks of Tasmania, which he has referred to two groups in the following descending order:—

(a) Gordon River Group.
(b) Auriferous Slate Group.

East of the Tamar in Tasmania Gould estimated that 1000 square miles were covered by Lower Silurian rocks.‡ The lower series consists of soft black and blue slates, grits, sandstones, and conglomerates, and in the western area at Middle Arm Creek, Beaconsfield, are estimated by Gould to be at least 2000 feet thick.§ They contain *Licrophycus* and Graptolites. Mr. Thureau has referred‖ remains of Graptolites from the Beaconsfield slates to *Didymograptus nodosus.*

A species of *Orthis* is also stated to have been found in these rocks. At Cabbage Tree Gorge in the Eastern Lower Silurian area in Tasmania, Mr. Johnston records¶ the occurrence of *Licrophycus* sp. almost identical in appearance with *L. Ottawensis* from the Trenton Limestone (Lower Silurian) of Canada. This is associated with remains of *Orthis* and with annelid tracks. Mr. Johnston, following the classification adopted at that time, refers *Licrophycus* to the *algæ*, but recent observations of course prove that it was probably merely the casts of worm burrows, with radiating trails.

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* The above areas, especially that given for the Cambrian, are only extremely approximate. The area quoted for the Silurian rocks may be too much or too little by about one-quarter of the area suggested.

† *Loc. cit.* pp. 54-63.

‡ Quoted by Johnston, *loc. cit.* p. 53.

§ Quoted by Johnston, *loc. cit.* p. 60.

‖ Quoted by Johnston, *loc. cit.* p. 52.

¶ *Loc. cit.* p. 52.

The upper group consists of quartzose sandstones, conglomerates, limestones, slates, and grits.

The limestones are largely formed of corals, including the widely distributed genera *Halysites, Favosites, Syringopora, Phillipsastræa*, &c.; but these have not yet been specifically described.

The earliest recorded cephalopods from Tasmania and Australia belong to the horizon of the Gordon River Limestone, in which they occur in some abundance, *e.g.—Lituites Gouldii*, Salter; *Orthoceras antilope*, Salter; *O. Murchisoni*, Salter; *O. theca*, Salter; *O. Youngii*, Salter. No less than eight species of the lamellibranch *Cyrtodonta* and two of *Tellinomya* have been described by Mr. Salter (MS.),* and Mr. Johnston records thirteen species of gastropods, including the characteristic Lower Silurian genus *Raphistoma*. *Raphistoma* in Europe ranges up to the middle of the Upper Silurian, but is more characteristic of the Lower Silurian. Three genera of brachiopods, *Orthis* sp., *Retzia mima*, Salter, and *Rhynchonella* sp., are also mentioned by Mr. Johnston as occurring in these rocks, and also an undescribed calcareous sponge (?), occurring in the Gordon Limestone.†

The Sandstones of the Tasmanian Lower Silurian rocks are finely laminated and ripple-marked.‡ With regard to the conditions under which these rocks were formed Mr. Johnston states§: "The laminated slates, with their graptolites, testify of fine muddy sediments formed in the deep sea bottoms far removed from the disturbing action of the surface waves; the limestones composed of corals and crinoids tell of quiet intermediate depths, where generation after generation undisturbedly lived and died; while the sands and gravel, now consolidated into sandstones, grits, and conglomerates, bespeak ancient shorelines and sandbanks, where littoral forms of life, such as *Orthis*, *Cyrtodonta*, *Scolithus*, and various Trilobites, swarmed much in the same manner as the cockle, lampshell, sandhopper, and lugworm upon our shores at the present hour."

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* f. Johnston, *loc. cit.* p. 63.

† *Loc. cit.* pl. II. fig. 13.

‡ f. Johnston, *loc. cit.* p. 44.

§ *Loc. cit.* p. 44.

Mr. Johnston evidently therefore considers the Lower Silurian rocks of Tasmania of littoral origin, or as having been formed in seas of moderate depth.

(2) In Victoria the total aggregate thickness of the Upper and Lower Silurian rocks has been estimated by Mr. A. R. C. Selwyn* as 35,000 feet.

Mr. R. A. F. Murray, F.G.S., the Government Geologist of Victoria, has divided the Silurian strata of Victoria into the following three groups† :—*(a)* Metamorphic rocks and crystalline schists. *(b)* Lower Silurian. *(c)* Upper Silurian.

The first group probably represents altered Lower Silurian rocks chiefly, but may include Cambrian and even Pre-Cambrian rocks. It is chiefly developed (1) between the Wannon and Glenelg Rivers near the west end of the Main Divide, and is in the line of strike of the Archæan, Cambrian and Silurian rocks of the west side of Tasmania, and (2) at the north-east end of the Main Divide between the Ovens and Murray Rivers, on the line of strike of the Archæan and Lower Silurian rocks of the east side of Tasmania.

The rocks consist of quartzites, granulite, foliated micaceous, talcose, chloritic, and serpentinous schists, chiastolite schist, leptynite schist, with garnets, hornblende schist, &c.‡

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* Notes on the Physical Geography, Geology, and Mineralogy of Victoria, by A. R. C. Selwyn and G. H. F. Ulrich, *Intercolonial Exhibition Essays*, 1866, p. 11. Melbourne, 1866.

† Victoria. Geology and Physical Geography, by Reginald A. F. Murray. By authority. Melbourne, 1887. pp. 33-47.

‡ R. A. F. Murray, *loc. cit.* pp. 37-38, and A. W. Howitt, "Rocks of Noyang," Trans. R. Soc. Victoria, xx. p. 18, and "Metamorphic Rocks of the Omeo District, Gippsland," Austr. Assoc. Adv. of Science, Vol. i. Sydney, 1887. pp. 206-222.

(b) The less altered Lower Silurian rocks are sandstones, slates, shales, and mudstones, with a few beds of conglomerate and breccia. Graptolites are so abundant in the shales as to make them carbonaceous. Over twenty-four species have been recorded,* and in addition the brachiopods *Siphonotreta micula*, McCoy, and *Lingula*, and a sponge, *Protospongia*. Two phyllopods have also been recorded—*Hymenocaris Salteri*, McCoy, and *Lingulocaris McCoyi*, R. Etheridge, Junr.†

(3) In South Australia at the Mount Macdonnell Ranges, Mr. H. Y. L. Brown has described‡ § rocks which Mr. R. Etheridge, Junr., considers to be Lower Silurian, as lying unconformably on Cambrian (?) strata.

The Lower Silurian rocks consist of sandstone, quartzite, and shale, with thin bands of fossiliferous limestone. The following fossils have been recorded and described from these rocks by Mr. R. Etheridge, Junr.‖ ¶ :—

Stems of Crinoids.

Asaphus (Megalaspis) Thorntoni, R. Etheridge, Brown's Leigh's Creek and Hergott Springs Reports, 1892, p. 8, pl. I.

Asaphus illarensis, spec. nov., R. Etheridge, Additional Silurian and Mesozoic Fossils from Central Australia, p. 5, pl. I. fig. 1.

Orthis leviensis, R. Etheridge, Junr., Brown's Leigh's Creek Report, 1891, pp. 13-14, pl. I. figs. 5-7, and Additional Silurian and Mesozoic Fossils from Central Australia, pp. 5-6, pl. I. figs. 2-5.

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* "Prodromus of the Palæontology of Victoria," by Frederick McCoy, Decade I. pp. 5-20, pl. I. and II.; *ibid.* Dec. II. pp. 29-37, pl. XX.; *ibid.* Dec. V. pp. 39-41, pl. L.

† Records Geol. Survey New South Wales, Vol. iii. Pt. 1, t. 4, fig. 2.

‡ South Australia. Report on the Coal-bearing Area in the Neighbourhood of Leigh's Creek, by H. Y. L. Brown. By authority. Adelaide, 1891. p. 13.

§ South Australia. Further Geological Examination of Leigh's Creek and Hergott Districts, and General Geology of the Finke River, by H. Y. L. Brown. By authority. Adelaide, 1892. p. 7.

‖ *Loc. cit.* Brown's Report, 1891, pp. 9-14, pl. I. and *loc. cit.* Brown's Report, 1892, pp. 8-9.

¶ South Australia. Additional Silurian and Mesozoic Fossils from Central Australia, by R. Etheridge, Junr., H. Y. L. Brown, Government Geologist. By authority. Adelaide, 1893. pp. 5-8 and plate, figs. 1-13.

Ophileta Gilesi, spec. nov., R. Etheridge, Junr., *ibid.* pp. 6-7, pl. I. figs. 6-8.

Raphistoma Brownii, R. Etheridge, Brown's Leigh's Creek Report, pp. 9, 10, and 13, pl. I. figs. 1-3.

Murchisonia sp., Brown's Further Report, Leigh's Creek and Hergott Districts, and Geology of Finke River, 1892, p. 9.

Pleurotomarioid univalve, Brown's Further Report, Leigh's Creek and Hergott Districts, and Geology of Finke River, 1892, p. 9.

Trochoid univalve, Brown's Further Report, Leigh's Creek and Hergott Districts, and Geology of Finke River, 1892, p. 9.

Orthoceras Tatei, spec. nov., R. Etheridge, Additional Silurian and Mesozoic Fossils, &c., p. 7, and Brown's Leigh's Creek Report, 1891, p. 10, t. I. f. 4.

Orthoceras Gossei, spec. nov., R. Etheridge, Junr., Additional Silurian and Mesozoic Fossils, &c., p. 7, pl. I. figs. 9-10.

Endoceras Warburtoni, spec. nov., R. Etheridge, Junr., *ibid.* p. 7, pl. I. figs. 12-13.

(4) New Zealand. Sir James Hector describes Lower Silurian rocks in the north-western area of the Nelson District,* termed by him the Aorere Series. Captain Hutton describes these same rocks.† Both these authorities show a strong unconformability between the Aorere Series and the schists of the underlying Manapouri System.

The rocks are dark bituminous slates with blue or grey limestones and cherty sandstones. Stems of Crinoids, several species of graptolites, related to the Victorian Lower Silurian forms, and one species of coral have been recorded by Sir James.‡

Folding.—The Lower Silurian strata of Tasmania are strongly folded. One very strongly developed anticline, described by Johnston, trends from Elliott Range in the south-west portion of Tasmania for over fifty miles in a direction N. 7° W.* The axes of the Lower Silurian in the north-west of Tasmania conform with those of the Archæan Group, which strike, as already stated, N. 25° W.

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* Catalogue and Guide, &c., to New Zealand, *loc. cit.* pp. 81-82.

† *Loc. cit.* Q.J.G.S. Vol. xli. p. 199.

‡ *Loc. cit.* p. 82.

In Victoria the Lower Silurian sediments have been very strongly folded, their strike varying from N. to N.W., the prevalent direction being N.N.W., and their dip being from 60° to vertical. This folding took place partly before the deposition of the Upper Silurian strata,† though no marked unconformability is visible between the two series. It is noteworthy that the trend of these folds is nearly at right angles to the trend of the Main Divide.

In the Mount Macdonnell Ranges the axes of folding strike persistently E. and W., but no evidence has as yet been obtained to show exactly when this folding took place. The absence, as far as is known, of Lower Silurian strata from New South Wales is probably due to the fact that its Main Dividing Range lies to the east of the general strike of the Lower Silurian strata of Victoria, which trend towards the flat country between Wagga and Hay, which is largely covered by Tertiary and Post-Tertiary deposits, which would conceal from view the underlying rocks, possibly of Lower Silurian Age.

In New Zealand the Aorere Series was certainly folded and denuded before the deposition of the Maitai rocks, approximately along axes parallel to the principal axis of the South Island.

Summary of Lower Silurian Epoch.—The sediments of this portion of the Silurian period show that in New Zealand and Victoria there were seas of some depth, on the floors of which at some distance from land the skeletons of graptolites accumulated in such numbers as to blacken the marine muds. The earliest Australasian Phyllopods are represented by the Victorian forms *Hymenocaris* and *Lingulocaris*.

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* *Loc. cit.* p. 64.

† f. Murray, *loc. cit.* p. 43.

In Tasmania the earliest Silurian sediments are graptolite shales similar to those of Victoria and New Zealand, and formed in seas of moderate depth.

There is then distinct evidence, as afforded by ripple-marked sandstones and beds of conglomerate, of shallow-water conditions and probable proximity to shore-lines. Temporary local cessations of sedimentation were marked by the accumulation of coralline and cephalopodan limestones, the corals and cephalopods specially distinguishing this Lower Silurian fauna from the preceding Cambrian fauna.

In the Macdonnell Ranges the conditions of accumulation of the Lower Silurian strata were probably similar to those of the Tasmanian Lower Silurian rocks, as shown by the nature of the sediments and by that of their contained fossils.

The New Zealand Lower Silurian rocks were folded on N.E. and S.W. axes, the Tasmanian on N. by W. to N.N.W. axes, the Victorian chiefly on N.N.W. axes, and the Mount Macdonnell rocks on E. and W. axes.

Amygdaloids are mentioned by Mr. Brown* at Wooltana and in the Arrowsmith Ranges and at Mount Jacob. It is uncertain, however, whether these are Cambrian or Silurian. If contemporaneous they represent the oldest known lavas in Australia. At Mount Jacob boulder conglomerates occur, blocks four to five feet in diameter being imbedded in limestone, quartzite, sandy shale, and clay slate.† The age of these boulder conglomerates is, however, doubtful.

B. UPPER SILURIAN.—Rocks of this age have been identified in Victoria, New South Wales, Tasmania and New Zealand.

(1) In Victoria they consist of sandstones, mudstones, rubbly shales, and occasionally slates, schists, and limestones, the last being partly crinoidal and partly coralline.

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* South Australia. Government Geologist's Report *re* Visit to Far North. By Authority. Adelaide, 1884. p. 4.

† f. Brown, *loc. cit.* p. 4.

At Cape Liptrap and Turton's Creek are bands of volcanic and calcareous sedimentary material. This is perhaps the first certain evidence in Australia of contemporaneous volcanic action. The Pre-Devonian volcanic ash beds of the Reid River in Queensland, described by Mr. R. L. Jack, F.G.S.,* may, however, be as old, if not older.

Taken in conjunction with the Lower Silurian rocks, these Upper Silurian have a thickness, as already stated, in Victoria of 35,000 feet. The Lilydale limestone and Moonee Ponds strata have yielded an abundant marine fossil fauna. The Echinodermata are represented by at least three species of ophiuroid starfish and two crinoids, and corals and trilobites (*Phacops*, *Lichas*, *Homalonotus*, *Bronteus*, and *Calymene*, &c.) abound. The interesting gastropod *Tremanotus* has lately been described from the Lilydale limestone by the Rev. A. W. Creswell, M.A.†

(2) In New South Wales, strata of Upper Silurian age are typically developed at Yass, where they are upwards of 3000 feet thick. They consist of sandstones, grits, conglomerates, olive-brown and blackish clay shales, and limestones. The lower strata of this series exhibit suncrack and ripple-mark very perfectly, as described in my report.‡

The sun-cracks in these rocks afford the first-known conclusive proofs of the existence of land in the Australian region. The pebble conglomerates of course imply a pre-existing land, so that portion of New South Wales must have been a land area, at least as far north as Mudgee, before Upper Silurian time. *Halysites* has been recorded from Bombala, from near Yass, from Wellington, and from near Molong, some beautifully preserved specimens having lately been obtained from the last-mentioned locality by the Rev. J. Milne Curran.

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* Geology and Palæontology of Queensland and New Guinea, by R. L. Jack, F.G.S., F.R.G.S., and R. Etheridge, Junr. Text, p. 19. Brisbane, 1892.

† Notes on the Lilydale Limestone, Proc. Roy. Soc. Victoria, p. 42, pl. VIII. fig. 1.

‡ Annual Report, Department of Mines, 1882, p. 148. By authority. Sydney.

Three species of *Receptaculites* have been recorded from the Upper Silurian rocks of New South Wales—*R. australis*, Salter, *R. Clarkei*, Salter, and *R. Neptuni* (?).* The doubtful occurrence of a single specimen of a graptolite is mentioned by Mr. Clarke,† and another specimen has been recorded by Mr. J. Mitchell, the latter from Yass.

Mr. R. Etheridge, Junr., considers the Yass rocks about homotaxial with the Wenlock Series of England.

At Wellington what is probably the oldest remains of a vertebrate yet found in Australia was discovered in the Cave limestone of that district by my late colleague on the Geological Survey of New South Wales, Mr. William Anderson. This appears to be a spine of a genus allied to *Onchus.* It has not yet been described.

Mr. Clarke mentions‡ a plate of *Coccosteus* resembling McCoy's *C. trigonaspis*, and an Ichthyodorulite from the Murrumbidgee, and Mr. J. A. Watt, M.A., a member of this Society, last year discovered a fossil fish plate at Coodra Vale. The exact horizon of both these localities is not yet known. The horizon is probably higher than that of Yass, and may prove to be Lower or Middle Devonian.

(3) In Queensland Mr. R. L. Jack has described§ Pre-Devonian schistose rocks at Charters Towers and in the valley of the Reid, contemporaneous volcanic breccias occurring at the latter locality, and on p. 23 he quotes the statement made by Mr. W. H. Rands, F.G.S.,|| that the Pre-Devonian schists at the Cape River are from five and a half to six miles in thickness. There is room, therefore, in this vast thickness for Silurian and perhaps Cambrian or even Archæan strata.

No fossiliferous sedimentary rocks, however, have as yet been found in Queensland older than Middle Devonian (Burdekin).

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* Remarks on the Sedimentary Formations of New South Wales, by the Rev. W. B. Clarke, M.A., F.R.S., &c. Fourth edition. Sydney, 1878. p. 16.

† *Loc. cit.* p. 12.

‡ *Loc. cit.* pp. 17-18.

§ *Loc. cit.* p. 19.

|| On the Cape River Goldfield. By authority. Brisbane, 1868.

(4) In Tasmania Mr. Johnston refers to the Upper Silurian epoch *(a)* hydro-mica slates, and white gritty sandstones, with *Orthis flabellum* and *Spirifera plicatella*, Linn., and *(b)* the Table Cape conglomerates (?), composed partly of rolled fragments of limestone containing *Pentamerus Tasmaniensis ; (c)* the Eldon Valley clay slates and mudstones, containing *Calymene*, and *(d)* the Fingal slates (?).

A single fossil, an *Anodonta* closely resembling *A. Jukesii*, has been obtained by Mr. Johnston from the Fingal slates. If this determination is correct, this is the earliest example of the occurrence of a shell of freshwater habit in Australasia, and is indicative probably of contemporaneous lacustrine or estuarine deposits.*

In New Zealand Sir James Hector classes† the Baton River Series as Upper Silurian, but it is more convenient here to include this and the overlying Te Anau and Reefton Series as part of the great Tákaka System of Captain Hutton.

Folding.—In Tasmania the rocks classed as Upper Silurian occupy synclinal troughs in the Lower Silurian rocks and have partaken, partly at all events, in their folding, and presumably are folded along axes parallel or subparallel with those of the older rocks.

In Victoria the folds are less sharp than those of the Lower Silurian strata. Their axes have a general strike from N.N.W. to N.W., but at Cape Liptrap the strike is from N. 10° E. to N. 30° E.

In New South Wales the strike is nearly meridional from Mount Kosciusko to Bathurst, and possibly as far as Mount Stuart to the north of Mudgee. This meridional line of folding must have been developed in time antecedent to that of the Upper Silurian, as conglomerates occur in the Upper Silurian Series as well as suncrack, both indicative of neighbouring land.

In Queensland the schists at the Cape Gold-field dip S.S.W. at 30° to 35°, the axis of upheaval striking therefore W.N.W. and

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* R. M. Johnston, *loc. cit.* p. 67.

† *Loc. cit.* p. 81.

E.S.E.* At Charters Towers the strike of the Pre-Devonian quartzites, greywackes, slates, and shales has been carefully determined to be N.W. and S.E., the rocks being folded.† At the Gilbert the Pre-Devonian slates strike W.N.W. to W.S.W.‡ At Peak Downs foliated and contorted micaceous and hornblende schists (Pre-Devonian ?) strike N.E. and S.W. The last-mentioned locality is on the line of strike of the great line of folding, which may be termed the Adelaide Axis, trending from St. Vincent's Gulf to Broken Hill and thence through Girilambone north-eastwards. The dominant strike of the Pre-Devonian schists in Queensland and of their axes of folding lies between N.W. to W.N.W.

As regards the date of the folding of the Upper Silurian strata in Tasmania, it must have antedated the Permo-Carboniferous, as the latter are not folded. The Upper Silurian rocks in Tasmania are not seen in contact with Devonian strata, the existence of this system not yet having been proved in that island.

In Victoria a considerable amount of folding of the Upper Silurian rocks took place before the Middle and Lower Devonian rocks were formed.§

In New South Wales the folding antedated certainly the close of the Devonian or commencement of the Carboniferous Period, and the folding of these Upper Silurian strata was probably the chief factor in the production of the southern portion of the Main Dividing Range in New South Wales.

In Queensland the folding of the Pre-Devonian rocks took place for the most part in Pre-Devonian time.

IV. DEVONIAN.

No rocks of undoubted Devonian Age have as yet been determined in Tasmania or in South Australia, but in Queensland,

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* Jack and Etheridge—Geology and Palæontology of Queensland and New Guinea, 1892, p. 20.

† *Loc. cit.* p. 27.

‡ *Loc. cit.* p. 29.

§ f. Murray, *loc. cit.* p. 56, and plate facing p. 51.

Victoria, and New South Wales they are well represented, and in New Zealand the Te Anau and Reefton Series of Sir James Hector* are referred by him to the Devonian Period.

In Victoria rocks of Lower Devonian and Middle Devonian Age rest unconformably upon Upper Silurian rocks, and in turn are capped by strongly unconformable strata of Upper Devonian or Lower Carboniferous Age.

A. LOWER DEVONIAN.—The Lower Devonian rocks consist chiefly of a volcanic series, the Snowy River Porphyries. These consist of felstone porphyries, felstone ash, and agglomerates, the upper 2000 feet being tuffaceous and the lower 1000 to 1500 feet being chiefly massive felstones. This series is 20 miles wide, 60 miles long, and attains an altitude of 6000 feet near the Cobberas.

This volcanic series† is situated over a meridional fissure, on which a series of volcanoes was built up in Lower Devonian time, comparable on a small scale to the Andes of South America. As the denuded stumps of these volcanoes now rise over 6000 feet above the sea, their original summits must have been far higher.

That the volcanic series is older than part at all events of the Middle Devonian Epoch is proved by the fact that the Buchan and Bindi Limestones of Middle Devonian Age occupy areas of erosion in the volcanic series.‡ §

No rocks analogous to the Snowy River Porphyries are known in New South Wales, unless the felsites of Major's Creek, near Braidwood,|| may be referred to a similar horizon.

It may be noted that in Lower Devonian time fractures of the earth's crust took place in Eastern Victoria, parallel to the meridional folds of the southern half of the New South Wales Main

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* *Loc. cit.* pp. 79-80.

† f. Howitt, quoted by Murray, *loc. cit.* p. 51.

‡ Murray, *loc. cit.* plate facing p. 51, and pp. 51-56.

§ A. W. Howitt, Report Austr. Assoc. Adv. Sci., Metamorphic Rocks of the Omeo District, Gippsland. Sydney, 1888. p. 209. Geological Survey of Victoria, Progress Report, iii. p. 181.

|| Annual Report, Department of Mines. Sydney, 1892. p. 121.

Dividing Range, and also that the volcanic outbursts succeeded the period of heavy sedimentation when the 35,000 feet of Silurian rocks were deposited.

B. MIDDLE DEVONIAN.—(1) Victoria. After the eruptions ceased subsidence followed to the extent of at least 3000 feet. This must have depressed the greater part of the south-east of Victoria, from Forest Hill to Cape Howe and thence at least as far as Sale, below sea-level. On the sinking sea-floor were laid down, first, coarse angular breccias, representing perhaps a shore-line, and composed of volcanic material indicating sub-marine or littoral volcanoes, probably the latter, as they are mixed with fragments of slate and sandstone belonging to the older Palæozoic rocks. Felsite, basalt, red rubbly beds, limestones, and yellow beds representing consolidated felsite mud follow,* the total thickness being from 700 to 1000 feet. Compact limestones, 400 to 500 feet, succeed, indicating a cessation of volcanic activity and suggestive of clear and warm sea-water free from much sediment.

The Tabberabbera shales and the Cobannah quartzites were probably formed contemporaneously with the Buchan limestone just described.

Among the fossils found in the limestones may be mentioned a ganoid placodermatous fish, *Asterolepis ornata,* Eichwald, var. *australis,* McCoy. Among the brachiopods, *Spirifer lævicostata* is specially characteristic.

Mr. George Sweet of Melbourne has been indefatigable in collecting remains of fossil fish from the Middle Devonian rocks of Victoria, and the publication of Professor McCoy's memoir on them, which has been in preparation now for several years, is being anxiously awaited by Australian geologists.

(2) In New South Wales Middle Devonian rocks have not yet been recognised, though it is probable that the limestones of Coodra Vale, near Yass, with remains of Coccostean fish, are homotaxial with the *Asterolepis* limestones of Victoria.

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* Murray, *loc. cit.* p. 55.

(3) In Queensland the Middle Devonian (Burdekin) formation consists of limestones, conglomerates, white siliceous sandstone, and red and green shales.

On the track from the Broken River to the Gilbert Diggings, the late Sir Richard, then Mr., R. Daintree, described the type section of the Middle Devonian rocks,* and Mr. R. L. Jack† describes the excellent section observable there in detail. The series commences with 300 feet of basal conglomerate, and comprises eight beds of coralline limestone having an aggregate thickness of between 2000 and 3000 feet. The total thickness of the strata is estimated at 20,782 feet. As the lower portion of the series, 10,000 feet thick, is not fossiliferous, it may belong to Lower Devonian or even in part to Upper Silurian time.

Mr. Gibb Maitland, F.G.S., describes‡ the strata of Middle Devonian Age on the Upper Burdekin as consisting largely of red shales, and east of the station at the Valley of Lagoons he states that the fine-grained sandstones of this series are crowded with suncracks, and are interstratified with beds resembling fine volcanic ash, testifying of course to contemporaneous volcanic activity.

East of the Fanning River the Middle Devonian limestone attains the enormous thickness of 7000 feet.§

These limestones, composed chiefly of corals (*Heliolites*, *Favosites*, &c.) and hydrocorallines (*Stromatopora*, *Stromatoporella*, &c.), have all the aspect of ancient coral reefs. The ancient history of this region may therefore be repeating itself to-day in the adjoining areas of the Great Barrier Reef of Australia.

The oldest land plant yet found in Australasia, *Dicranophyllum australicum*, Dawson, was discovered by Mr. R. L. Jack in this Middle Devonian Series,|| and has been described by Sir William

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* Q.J.G.S. Vol. xxviii. pp. 290-291.

† Geology and Palæontology of Queensland, pp. 36-38.

‡ Report on the Geology and Mineral Resources of the Upper Burdekin Beds, by A. Gibb Maitland. Brisbane, 1891.

§ f. R. L. Jack and R. Etheridge, Junr., *loc. cit.* p. 36.

|| *Loc. cit.* pp. 36 and 49.

Dawson.* If this fossil plant be referable to the Coniferæ, it forms the first conclusive evidence of the existence of a contemporaneous land flora in Australasia, and confirms the proofs of the existence of a contemporaneous land surface afforded by the suncracks in the sandstones.

Messrs. Jack and Etheridge consider† the Burdekin Formation (Middle Devonian of Queensland) to be homotaxial with the Buchan and Bindi Limestones of Victoria.

C. DEVONIAN, LOWER, MIDDLE OR UPPER.—(1) In New Zealand from Silurian time up to the commencement of the Permo-Carboniferous (?) Period sediments were continually deposited, without marked unconformability, until the system termed by Professor Hutton the Tákaka System had attained the almost unprecedented thickness of about 100,000 feet in Otago.‡ This immense systém of rocks, having a thickness of nineteen miles and now uplifted and so denuded that what were the lowest beds are now exposed to view, should afford very important evidence as to the thickness and constitution of the earth's crust.

It might naturally have been expected that such a vast amount of sedimentation by its downward bulging of the earth's crust would lead sooner or later to exceptional volcanic outbursts. The Dun Mountain eruptive series, which Sir James Hector considers contemporaneous with the upper part of the Tákaka (Upper Devonian), or with the base of the Maitai Series (Carboniferous), consists of the unique ultrabasic rock, dunite, and an enormous thickness of "greenstone breccias, aphanite slates, diorite sandstones, &c."

(2) In West Australia Mr. E. T. Hardman has described § rocks of Devonian (?) Age at the Rough Range in the Kimberley District as containing *Stromatopora*, corals, *Spirorbis*, *Serpulæ*, &c., some of Devonian, others of Carboniferous affinities. In his later

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* Q.J.G.S. 1881, xxxvii. p. 306, t. 13, fig. 15.

† *Loc. cit.* p. 45.

‡ Q.J.G.S. May, 1885, p. 199.

§ Report on the Geology of the Kimberley District, West Australia, p. 17.

report* made in 1885 he states that the total thickness of hard grits, conglomerates, limestones, and slaty shales of Devonian Age is 10,944 feet, as developed at Mount Kinahan in the above district.†

Mr. H. P. Woodward describes‡ Devonian rocks as being largely developed in the Carr-Boyd Ranges of Kimberley, and in a belt 200 miles long from the Saw Ranges to the Lubbock Range. The Albert Edward and Barrier (at Kimberley) Ranges are also probably formed of Devonian rocks. Near Dillon Springs, Kimberley, the Devonian rocks are formed of quartzites and slates. They strike N.E. and S.W. and have been much folded, dipping in places at 70°, whereas the adjoining Carboniferous strata are nearly horizontal. The Devonian rocks are described by Mr. Woodward as consisting of sandstones, coarse grits, conglomerates, shales, slates, and hard limestones, with veins of agate and chalcedony.§ Mr. Hardman also mentions || contemporaneous dolerites, anamesite, volcanic breccias, ash beds, &c., in the Devonian Series, the basalt being estimated to be 1000 to 1100 feet thick. The lavas are stated to show distinct bedding in places at 5° to 10°. The tuffs are composed of basalt and Devonian grit.

The statement, however, made by Mr. Hardman in his 1885 Report, p. 19, that these basalts pass into diorite in places, hornblende replacing augite, and his statement in his 1884 Report, p. 18, that immediately over the basalts the carboniferous limestone passes into red jasper, are very suggestive of these basic and intermediate rocks being intrusive laccolites, like the gabbros of portions of the Tiers of Tasmania, the intrusive character of which has been ably proved by Mr. Thomas Stephens, M.A.

Summary of Devonian Period.—In Victoria in Lower Devonian time extensive volcanic eruptions took place of subaerial or

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* *Loc. cit.* p. 20.

† Geol. Mag. No. 309, pp. 100-102, and No. 311, pp. 193-199.

‡ Report on the Goldfields of the Kimberley District. By authority. Perth, 1891. p. 10.

§ *Loc. cit.* p. 9.

|| *Loc. cit.* p. 18, and Report on the Geology of the Kimberley District, Western Australia. By authority. Perth, 1885. p. 19.

subaqueous tuffs and lavas of an acidic character, the series, about 3000 feet in thickness, being strongly unconformable to the Upper Silurian Series, and the eruptions being probably consequent on the prolonged subsidence, during which the 35,000 feet of Silurian (Upper and Lower) sediments were laid down in Victoria. Erosion and subsidence followed, to the amount of 4000 feet in places, considerably reducing the land area in Eastern Victoria. Felsitic and basic eruptions on a progressively diminishing scale upwards prove that the great chain of meridional volcanoes which produced the Snowy River Porphyries was becoming moribund and eventually became extinct long before the Buchan and Bindi limestones, with their remains of bony-plated fish, were deposited in the eroded hollows of the volcanic series.

In New South Wales also about Middle Devonian time there was probably considerable subsidence, the Coodra Vale limestones with fossil Coccostean fish being now over 1000 feet above sea-level.

In Queensland during prolonged subsidence over 20,000 feet of strata accumulated, of which at least half, perhaps the whole, are Middle Devonian, the Fanning limestone alone having a thickness of 7000 feet, and being chiefly formed of corals and corallines. The first evidence of a contemporaneous land flora in Australasia is afforded by the plant *Dicranophyllum australicum*, Dawson, of the Queensland Middle Devonian Series. The abundant suncracks in the sandstones also prove contemporaneous land areas in Queensland, though the prolonged subsidence must have much restricted the land area in the Burdekin and Fanning River Districts. Contemporaneous volcanic eruptions are evidenced by interbedded tuffs.

In the Kimberley District of West Australia the conglomerates in the Devonian Series imply neighbouring land areas, and there is evidence (f. Hardman) of extensive contemporaneous basaltic eruptions, the basalt sheet being over 1000 feet thick. *Atrypa reticularis*, *Rhynchonella pugnus*, an *Orthoceras*, and two species of *Goniatites* are recorded from these beds at Kimberley.*

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* Annual General Report for 1890, by H. P. Woodward. By authority. Perth, 1891. p. 17.

In New Zealand the Te Anau and the Reefton Series complete the sediments constituting Hutton's Siluro-Devonian Tákaka System, nineteen miles in thickness. Extensive contemporaneous eruptive rocks, including the rare ultrabasic rock dunite, are stated by Hector to have been erupted in Devonian time, but Captain Hutton questions the contemporaneity of the eruptive series.

Folding.—In Victoria the Middle Devonian rocks, as represented by the Bindi limestones, have a general N.W. and S.E. strike. The Tabberabbera shales and Cobannah quartzites have been highly folded subsequent to the folding of the Silurian rocks.* This folding was almost completed before the deposition of the overlying *Lepidodendron* beds, probably of Lower Carboniferous Age, as has been proved by Mr. A. W. Howitt.†

In New South Wales nothing is yet known about the folding of the Coodra Vale Middle Devonian (?) limestones.

In Queensland the Middle Devonian rocks at Burdekin Downs strike N.E. and S.W., and are folded. On the Broken River the folds trend N.E. by N., the dip varying from 20° to 75°. At Kangaroo Hills the axes run N.E., and at Chillagoe E.S.E.

Mr. R. L. Jack has kindly informed me by letter "that there is no evidence as to when this folding took place in Queensland, as the Devonian is not seen anywhere in contact with newer rocks, and so we cannot tell whether they have been folded together or not. The hiatus, however, between Middle Devonian and our next series (Gympie) itself implies an upheaval and in all probability a folding prior to Gympie times" (Carboniferous.—T.W.E.D.).

If the Middle Devonian of Queensland is the equivalent of the Buchan and Bindi limestones of Victoria, and these rocks in Victoria were folded before the deposition of the Lower Carboniferous or perhaps even Upper Devonian rocks, it is highly probable that the first foldings of the Middle Devonian rocks ot Queensland antedated the commencement of the Carboniferous or the close of the Devonian Period in Australia.

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* Murray's Geology of Victoria, p. 56.

† Geological Progress Report, No. iii. p. 214 and following; and Murray's Geology of Victoria, pp. 51-64, pl. 13, 15, and 16.

Whereas the principal axes of folding of the Middle Devonian in Victoria strike N.W. and S.E., those of the Queensland Devonian rocks strike principally N.E. and S.W.

In the Kimberley District of West Australia, N.E. strikes prevail, and, as already stated, whereas the Devonian rocks are much folded, dipping at 70°, the contiguous Carboniferous strata are almost horizontal, showing that most of the folding took place between the close of some portion of the Devonian Period and the commencement of the Carboniferous Period.

One of the most striking features in the folding of the Australian Palæozoic sediments in Victoria and West Australia is the immense contrast between the amount of folding to which the Middle Devonian rocks have been subjected as compared with the Carboniferous. No true folding appears to have taken place in Victoria or at the Kimberley District of West Australia since the close of the Devonian Period.

In New Zealand the vast Tákaka System was much folded and eroded before the deposition of the succeeding Maitai System, as shown on Captain Hutton's section* and Sir James Hector's section.† The great Te Anau Fault‡ was formed probably, but not certainly, before the Maitai System was deposited. There is no evidence of any land occupying the present site of New Zealand up to the close of the Tákaka System, the deposits resembling those laid down on the shores of a continent in seas of moderate depth. There is a marked absence of conglomerates and of any evidence, such as ripple-mark, suncrack, current bedding, &c., indicative of shallow water conditions, and in the succeeding Maitai System portion of the deposits are considered by Hutton§ to be probably abysmal.

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* *Loc. cit.* p. 195.

† *Loc. cit.* p. 80.

‡ f. Hutton, *loc. cit.* p. 196.

§ *Loc. cit.* p. 201.

V. CARBONIFERO-DEVONIAN OR UPPER DEVONIAN.

Rocks of this age, characterised specially by *Spirifera disjuncta*, *Rhynchonella pleurodon*, and a *Pteronites*, which Mr. R. Etheridge, Junr., is now describing as a new species, *P. Pittmani*, have so far been observed only in the Mount Lambie District of New South Wales.*

In the type district at Mount Lambie they consist of a marine and of a freshwater series, the latter being uppermost. No unconformability, however, has been observed between the two series, and Mr. Wilkinson grouped them together as Devonian. The lower series consists of quartzites containing abundant fossils, especially *Spirifera disjuncta* and *Rhynchonella pleurodon*, reddish purple shales, and beds of conglomerate, grit, and hard dark mudstones. The rocks of the upper series are chiefly argillites, shales, mudstones, and reddish-purple shales, with bluish-grey felspathic quartzite and white quartzite. The thickness of the whole series is estimated by Mr. Wilkinson as about 10,000 feet. Possibly the upper series may hereafter be referred to the Carboniferous, and only the lower to Upper Devonian or Carbonifero-Devonian.

Near Rydal a strong unconformability is observable between the marine Permo-Carboniferous strata and the freshwater series of the Upper Devonian, the latter dipping at angles of from 30° to 40° to the E., 15° N. or W., 15° S.; while the former has a gentle north-easterly dip of not more than 4°.

The base of these Upper Devonian rocks is not seen near Mount Lambie, but on the road to the Jenolan Caves, six and nine miles from the caves towards Mount Victoria, a coarse conglomerate, perhaps representing the base of this series, appears to rest unconformably on the Cave Limestone Series (Upper Silurian), as has lately been observed by Messrs. W. F. Smeeth, J. A. Watt, and myself. A *Heliolites* and casts of crinoids have lately been discovered by Mr. Voss Wyburd in this conglomerate.

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* Remarks on the Sedimentary Formations of New South Wales, by the Rev. W. B. Clarke. Fourth edition, 1878, pp. 17 and 22. And Geological Map of the Districts of Hartley, Bowenfels, Wallerawang, and Rydal, with Notes and Sections, by C. S. Wilkinson. By authority. Sydney, 1875.

At Yetholme and at the limekilns near Bathurst Mr. Clunies Ross, B.Sc., has lately described[*] a junction between the Upper Devonian rocks and the limestone series near Bathurst, and he considers the general evidence to show that there too the junction is unconformable. The upper series of the Carbonifero-Devonian contains *Lepidodendron australe*, which occurs in numbers along certain horizons. In the lower series *Lepidodendron australe* was discovered for the first time by Mr. Clunies Ross[†] in Winburndale Creek,[‡] and by Mr. Pittman and the author at Mt. Lambie; in both cases the specimens were obtained from the horizon of the *Spirifera disjuncta* sandstone. The marine series contains *Spirifera disjuncta* in vast numbers, as well as *Rhynchonella pleurodon* and *Pteronites Pittmani*. [§] These fossils occur in profusion both above and below the horizon where *Lepidodendron* was found by Mr. Pittman and myself, and *Spirifera disjuncta* is bedded in the same block with *Lepidodendron australe* (?) in Mr. Clunies Ross' specimen.

At Mt. Lambie and Winburndale Creek, therefore, there is evidence to show that the land flora represented in Queensland in Middle Devonian time by *Dicranophyllum* was represented in New South Wales in Carbonifero-Devonian time by early types of *Lepidodendron* allied to *L. australe*. These Devonian rocks near Mt. Lambie have been folded, the axes of folding striking about N. 15° E. and S. 15° W.

Near Capertee the axes of folding strike N. 40° W.

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[*] Read before Geological Society of London, November 8th, 1893. Abstract given in Geol. Mag. No. 354. New Series. Decade III. Vol. x. No. xii. pp. 573-574.

[†] *Loc. cit.*

[‡] Also Proc. Aust. Assoc. Adv. Sci. 1892, iv. pp. 332-337. On the occurrence of *Lepidodendron* near Bathurst, N.S.W., by W. J. Clunies Ross, B.Sc., F.G.S., &c.

[§] Records Geol. Survey New South Wales, Vol. iii. Pt. iv. 1893, p. 199. On the occurrence of *Lepidodendron australe* (?) in the Devonian rocks of New South Wales, by T. W. E. David and E. F. Pittman, with plates XVII.-XIX.

As regards the date when this partial folding of the Upper Devonian of New South Wales took place, it certainly was earlier than the Permo-Carboniferous Period in New South Wales, and was perhaps contemporaneous with a portion of the Permo-Carboniferous Period of Queensland.*

VI. CARBONIFEROUS.

(1) Victoria. In Victoria rocks of Carboniferous (possibly Upper Devonian) Age, though inclined and undulating, are in some places horizontal, and have nowhere been folded or metamorphosed to the extent observable in the older rocks.

Rocks referable to the above horizon are developed chiefly in two areas, in the east and western portions of Victoria respectively.

The eastern development forms an immense trough, extending in a N.W. and S.E. direction from Mansfield to Gippsland, 100 miles in length, and averaging 20 miles in width. The Iguana Creek beds, typical of this series, are composed of bedded felstones, conglomerates, quartzose sandstones, reddish sandstones and shales.

The following fossil plants have been recorded from them :— *Cordaites australis*, McCoy, *Archæopteris Howitti*, McCoy, allied to the Canadian Upper Devonian *A. Jacksoni*, and to the *A.*

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* Unfortunately the expression Permo-Carboniferous is used with two very different meanings by Queensland and New South Wales geologists respectively. In New South Wales the term Permo-Carboniferous is applied to a group of rocks partly marine partly freshwater, the freshwater beds being specially characterised by the prevalence of *Glossopteris* and *Gangamopteris*, while the marine beds contain a fauna partly of Permian and partly of Carboniferous affinities. This is the equivalent of the Middle and Upper Bowen Series of Queensland, but in the latter colony an immense series of older beds is included under the term Permo-Carboniferous, as for example the Lower Bowen, the Star, and the Gympie Series. Probable equivalents of all these are found in New South Wales, but as in New South Wales the junction between the *Glossopteris* group and that immediately below it appears to be unconformable, and there is certainly a very strong break in the flora, the underlying group has been separated from the overlying and is provisionally called Carboniferous, as the fossils contained in it, both plant and animal, are simply of Carboniferous types, without any important admixture, as far as at present known, of Permian forms.

Hibernica of the Upper Devonian of Kilkenny, Ireland, and *Sphenopteris iguanensis*, McCoy.

At Tabberabbera Mr. Howitt describes[*] these Carboniferous rocks as dipping at a low angle off the almost vertical strata of the Middle Devonian rocks. At Snowy Bluff Mr. Murray describes this series as being 2000 feet thick, with sheets of contemporaneous felsite near the base, and at least seven distinct sheets of contemporaneous basalt in the middle and upper portion associated with beds of red shale and red sandstone.

The Avon River sandstones, which lie at the S.E. end of the basin, contain *Lepidodendron (Bergeria) australe*, considered by McCoy to be Lower Carboniferous. Murray states[†]: "I am inclined to believe that the beds in which it is found are among the uppermost of the group, and younger than, though conformable with, the Upper Devonian beds of Freestone and Iguana Creeks. It is highly probable, therefore, that the Avon sandstones are—as indicated by Professor McCoy on palæontological evidence—of Lower Carboniferous Age, or passage beds in that direction upwards from the Upper Devonian beds." In the section given by Murray[‡] a considerable thickness of Upper Devonian (Carbo niferous.—T.W.E.D.) conglomerates, melaphyres, sandstones, and red shales are shown to underlie the *Lepidodendron* sandstones of the Avon River. A thick red breccia conglomerate usually marks the junction of this formation with the Upper Silurian rocks. The prevalence of red material in this formation is due probably to the oxidation of fine volcanic dust, resulting from the eruptions which produced the contemporaneous basalts, such as those at Snowy Bluff.

The Victorian Carboniferous rocks strikingly resemble lithologically the Carboniferous rocks of New South Wales, as developed in the Braidwood district near Major's Creek and at the Clyde Mountain. *Spirifera disjuncta* has not yet been found in the Victorian rocks.

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[*] Geological Progress Report, No. iii. p. 214 onwards. By authority. Melbourne.

[†] *Loc. cit.* p. 67.

[‡] *Loc. cit.* p. 68.

The general dip of the Upper Devonian rocks near the Avon River is S.E. at a low angle. Where, however, the rocks have been locally folded, the axes of folding strike N.N.W. and S.S.E. At Mt. Tambo the series is 1500 feet thick and has been folded on a N.W. and S.E. axis.

In the western area of Victoria Carboniferous (?) rocks attain a thickness of over 2000 feet in the Grampians, and are chiefly sandstones and sandy flags. A syncline, having a N.N.W. and S.S.E. trend, is developed between the Grampians and Mount Dundas, both of which are composed of these rocks. No evidence has been obtained to show the upward limit in geological time for the folding of the Carboniferous rocks of Victoria.

(2) In New South Wales the sandstones and conglomerates of the Clyde Mountain, near Braidwood (the former crowded with innumerable casts of *Rhynchonella pleurodon*), and the marine sandstones and rubbly red grits, in which *Lepidodendron australe* was found by Mr. W. P. Hammond and Mr. W. Anderson* at Back Creek, near Major's Creek, may be referred to some horizon in the Carboniferous provisionally, though it is quite possible that they may be hereafter referred to some part of Carbonifero-Devonian, or Upper Devonian, time. At Back Creek the dip is S. 20° E. at 8° and at the Clyde Mountain it is E. 20° S. at 45°.

It is not yet known whether these rocks are older or newer than the Gympie Series (Carboniferous.—T.W.E.D.) of Queensland. The presence of *Rhynchonella pleurodon* is inconclusive, as at Mt. Lambie it is associated with *Spirifera disjuncta*, and in the Star Series of Queensland it occurs in strata newer than the Gympie.

Until lately the Gympie Series had not been identified in New South Wales, though traced from Queensland to the borders of New South Wales between Ballendean and Bonshaw. I have, however, lately come to the conclusion that the whole of the Palæozoic sedimentary rocks of the Vegetable Creek district, provisionally classed by me as Upper Silurian or Siluro-Devonian, are referable rather to the Gympie horizon, as they contain a form closely allied to *Protoretepora ampla*, and also a small species of *Productus* not determinable specifically. The rocks are chiefly unfossiliferous dark grey claystones alternating with harder and more quartzose bands with occasional bands of gritty sandstone and pebble conglomerate, though the latter is absent from the lower part of the series, which is also unfossiliferous. Near Ashford a bed of limestone, perhaps a thousand feet thick, occurs, possibly interstratified in this series.* The thickness of the whole series has not been determined, but it must be many thousands of feet. These rocks have been much folded. Their prevalent strike in the Vegetable Creek district is N.N.W. and S.S.E. They are far more strongly folded than the *Lepidodendron australe* beds which dip off them and may be unconformable to them, and, what is important, the author last January observed that at Fraser's Creek, near Ashford, they were strongly unconformable to the rocks of the Permo-Carboniferous System. The Gympie beds in that locality must have been tilted into a nearly vertical position before the *Gangamopteris* coal measures (Permo-Carboniferous) were deposited upon their eroded surface. The basal conglomerates of the Permo-Carboniferous rocks there are almost wholly composed of rolled fragments of felspathic quartzites and hardened claystones derived from the Gympie Series.

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* Annual Report Department of Mines, pp. 121-125. By authority. Sydney, 1892.

The Gympie Series has not yet been identified on the eastern side of the great granite plateau of New England, but judging from the lithological character of the rocks between Tenterfield and Tabulam, I think they might provisionally be referred to the Gympie horizon. The calcareous shales and mudstones of Upper Muswellbrook, containing *Productus semireticulatus* and *Phillipsia*, are probably homotaxial or perhaps a little higher in the series, and may belong to a horizon homotaxial with that of the Star Series of Queensland. The clay shales in the upper portion of the

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* Mr. G. A. Stonier, F.G.S., of the Geological Survey of New South Wales, however, informs me that he is extremely doubtful as to these thick limestones in the Bingara district and elsewhere in New England being interstratified with the Gympie Series.

Mt. Lambie Series, which overlie the *Spirifera disjuncta* beds, are lithologically much like the Gympie rocks of New England and may perhaps hereafter have to be referred to that horizon. At Barraba the *Lepidodendron australe* beds appear to me to be probably unconformable to the Gympie, as they are simply inclined at moderate angles dipping off the much folded Gympie rocks. No actual section, however, has been observed showing an unconformable junction.

In the Stroud district, associated with a marine Carboniferous fauna, *Lepidodendron volkmannianum* and *L. veltheimianum* and *Rhacopteris* have been recorded.*

These strata have been estimated by Mr. J. Mackenzie, F.G.S., the Government Examiner of Coal-fields, to have a thickness of about 10,000 feet, as shown on his unpublished sections. The thickness was stated by me to be 11,300 feet†, but I have since seen evidence which necessitates the removal of the upper 1309 feet from the top of that section and joining it to the Permo-Carboniferous System, which reduces the thickness of Carboniferous rocks in the Stroud District to that originally mentioned by Mr. J. Mackenzie. The lower half of the section is partly marine and partly freshwater, containing *L. veltheimianum* associated with *Rhacopteris* and *Calamites*. The strata are chiefly arkose sandstones and conglomerates, with thin beds of crinoidal limestone oolitic in places. The upper half is partly volcanic and partly freshwater, consisting of conglomerates, sandstones, and cherty shales, containing *Rhacopteris* and *Calamites* in profusion to the entire exclusion of *Lepidodendron*, and associated with contemporaneous felsites and melaphyres and felsitic and basic tuffs and purplish red shales. These *Rhacopteris* shales are the last and newest of the Carboniferous rocks of New South Wales, and are probably on a somewhat higher horizon than that of the Star Beds in Queensland. *Lepidodendron austràle* has not yet been discovered in the Stroud District.

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* Geological and Palæontological Relations of the Coal and Plant-bearing beds of Palæozoic and Mesozoic Age in Eastern Australia and Tasmania, by Ottokar Feistmantel, M.D., &c., Sydney. By authority. 1890. pp. 37, 139-141, 169.

† Report of the Australasian Association for the Advancement of Science, Melbourne, 1890, p. 405.

(3) Queensland. Although Queensland geologists group all their Carboniferous and Permo-Carboniferous rocks together under the term Permo-Carboniferous, I propose, for the purposes of this paper, to class as Carboniferous their Gympie, Star and Lower Bowen Series, and to apply the term Permo-Carboniferous to the Middle and Upper Bowen Series only, the two last being characterised by the abundant association of *Glossopteris* with a Palæozoic fauna, more Permian than Carboniferous, *Productus brachythœrus* and *Strophalosia* being specially characteristic.

In the older group, however, comprising the Gympie and Star beds, the marine fauna is more Carboniferous than Permian, the trilobites *Phillipsia* and *Griffithides* being of not uncommon occurrence together with *Productus cora*, *Productus subquadratus* and *Productus semireticulatus*. It is stated* that in this older group ninety-five species are peculiar to the Gympie beds, twelve are common to the Star beds, seventeen to the middle series of the Bowen River coalfield, and two to the upper series. The flora in the upper series of the older group, the Star, is decidedly Carboniferous, containing an abundance of *Lepidodendron australe.*

A. THE GYMPIE SERIES, in the type district at Gympie, has been well described by Mr. W. H. Rands in his elaborate report.† The thickness of the Gympie rocks is estimated at 2000 feet at Gympie and 21,000 feet at the Hodgkinson goldfield. The rocks at Gympie consist of greywackes, altered sandstones, carbonaceous shales, grits, conglomerates, breccias, limestone, volcanic tuff and amygdaloid. At the Hodgkinson goldfield they are chiefly shales and conglomerates. The chief fossils are:—*Cordaites australis*, McCoy (?), *Protoretepora ampla*, *Martinia subradiata*, *Productus cora*, D'Orb. *Lepidodendron australe*, McCoy, has been found associated with *Protoretepora* at the Training Wall Quarries,

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* Geology of Queensland, Jack and Etheridge, p. 96.

† On the Gympie Goldfield. Brisbane. By authority. 1889.

Rockhampton, and in marine strata of Gympie Age at the Hodgkinson goldfield.*

B. THE STAR FORMATION.—In the type district shales, conglomerates, sandstone and thin limestone attain a thickness of 1353 feet. *Lepidodendron australe*, McCoy, occurs throughout half that thickness, and at the junction of Corner Creek with the Great Star River *L. veltheimianum*, Sternb., is associated with it. The oldest foraminiferal limestone at present known in Australia occurs in this formation at Bogantungan. It is only about one foot in thickness, and is composed chiefly of shells of undescribed foraminifera.†

At the Keelbottom River contemporaneous amygdaloidal dolerites and porphyrites are interbedded with the Star Series. The porphyrites contain large masses of native copper, like the dolerites of the Lake Superior Region of North America.

At the Cape River *Lepidodendron australe*, *Cyclostigma* sp. and a Palæoniscid fish, probably *Palæoniscus* itself, have been found in rocks belonging to the Star Series.‡ In the Drummond Range at Bogantungan these beds are at least 2000 feet thick and contain§ abundant fish remains in nodules. These have been described by Mr. R. Etheridge, junr.||

The late Mr. James Smith of Rockhampton is quoted by Messrs. Jack and Etheridge¶ as stating that these fish must have been in incredible numbers, like a herring shoal.

Among the fossil plants of the Star Series may be specially mentioned** *Lepidodendron australe*, McCoy, *Calamites varians*, Germar, *Cyclostigma australe*, Feist., (?) *Cyclostigma* sp., Feist.,

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* Geology of Queensland, Jack and Etheridge, *loc. cit.* p. 115.

† Geology of Queensland, Jack and Etheridge, p. 131.

‡ Geology of Queensland, Jack and Etheridge, p. 136.

§ *Loc. cit.* p. 138.

|| "Note on the Occurrence of Fish Remains in the Rocks of the Drummond Range, Central Queensland," by R. Etheridge, junr. Records Geol. Survey, New South Wales, Vol. ii. pt. 2, 1890, p. 72.

¶ *Loc. cit.* p. 139.

** *Loc. cit.* p. 141.

allied to *C. Kiltorkense*. *Stigmaria* sp. ind., Tenison-Woods, *Cordaites australis*, McCoy, *Phillipsia dubia* and *Rhynchonella pleurodon* may be specially mentioned amongst the associated fossil fauna. The Star beds have not a single species, as far as known, common to the Burdekin beds (Middle Devonian).

The absence of both *Rhacopteris* and *Archæopteris* from the Queensland Carboniferous Flora is worthy of comment. Both are found on homotaxial horizons in New South Wales and Victoria, and the former fern occurs in great abundance, to the almost entire exclusion of every other kind of plant but *Calamites*. In New South Wales it ranges at least as far north as Branxton.

(4) West Australia. Mr. W. H. Huddleston has described Carboniferous fossils from the Gascoyne River.* Mr. A. H. Foord has described fossils from the Kimberley District.† Mr. Hardman has described rocks of Carboniferous Age as covering an area of at least 1500 square miles in the Kimberley District of West Australia. They consist of a lower series of limestones from 1000 to 1300 feet in thickness, with red shales, marls, occasional layers of gypsum and traces of rock salt, and an upper series of fresh-water sandstones, 1500 feet in thickness. The Carboniferous system is stated to owe its preservation in this district to a strong N.W. and S.E. fault.‡ This limestone dips at from 5° to 35°, but for the most part is only gently inclined. It forms bold precipitous escarpments, such as those in Geikie Ranges and the Napier Ranges. Hardman states,§ "At Geikie Cañon, on the Oscar Ranges, in places these (limestone cliffs) come down sheer to the water's edge, and everywhere they are crowned with the semblances of ruined turrets and battlements that one could well imagine to be the relics of some mighty Cyclopean fortress of the olden time." It is dolomitic in places, in colour varying from light grey to pink.

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* Q.J.G.S. Nov. 1883, p. 582.

† Geol. Mag. New Series, Dec. III. Vol. vii. No. iii. pp. 97-105; and *ibid.* No. iv. pp. 145-155; and *ibid.* No. v. pp. 193-204. H. A. Nicholson and G. J. Hinde.

‡ Report on the Geology of the Kimberley District, by E. T. Hardman. By authority. Perth, 1884. p. 20.

§ *Loc. cit.* p. 17.

In the Carboniferous rocks at Agate Hill Mr. Hardman describes* a bed of white chalcedony 100 to 150 feet thick.

Amongst the fossils recorded may be mentioned† *Producta gigantea*, *P. semireticulata*, *Streptorhynchus crenistria*, *Rhynchonella pleurodon*, *Spirifera lata*, *Poteriocrinus*, *Stenopora Tasmaniensis*, *Zaphrentis*, *Stromatopora*. The sandstones of the Upper Series pass downwards into conglomerates. They contain much nodular hæmatite. At Yarralla Hill Mr. Hardman records‡ the occurrence of *Lepidodendron*, *Lepidostrobus*, *Lepidophyllum*, *Sigillaria* and *Sagenaria*; and Mr. H. P. Woodward also mentions the occurrence of *Cyperites*.§

I am informed by Mr. R. Etheridge, junr., that the specimens of *Lepidodendron* collected by Mr. Hardman were presented to the Imperial Institute. It is much to be hoped that they will shortly be described and compared with East Australian forms. A brief description has already been published by Mr. A. H. Foord,‖ from which it would appear that the specimens are unlike *L. australe*, but they were mostly very imperfectly preserved.

Folding.—In Victoria the general direction of folding of the *Lepidodendron* Series appears to have been N.N.W. and S.S.E., both in the Eastern and Western areas, but there is no evidence to show when this folding took place, as regards upward limit in geological time, in Victoria.

In New South Wales, in the Southern portion, the Carboniferous rocks are highly inclined at the Clyde Mountain, but we have not sufficient evidence yet to admit of generalising on the direction of folding. The tilting almost certainly antedated the Permo-Carboniferous Period, as in neighbouring areas the Permo-Carboniferous strata are nearly horizontal.

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* *Loc. cit.* Report 1884, p. 18.

† Report on the Geology of the Kimberley District, by E. T. Hardman. By authority. Perth, 1885. p. 26.

‡ *Loc. cit.* 1884 Report, p. 19.

§ Western Australia. Annual General Report for 1890. By authority. Perth, 1891.

‖ Geol. Mag. No. 309, New Series, Dec. III. Vol. vii. No. iii. pp. 102-103, pl. iv. figs. 4-8*a*.

In the Stroud district the whole of the Carboniferous rocks are highly folded on nearly meridional lines inclining slightly to west of north. The folding here may have commenced in the Permo-Carboniferous, but for the most part it took place subsequent to the deposition of the Permo-Carboniferous rocks, as the latter have been involved in the folding.

In New England the Gympie Series has been highly folded along axes striking between W.N.W. and N. by W., the general direction appearing to be about N.N.W.

In Queensland the rocks of the Star Series do not appear to have been much folded, and this is also the case with their equivalents in New South Wales.

The general lines of folding of the Gympie in Southern Queensland appear to have been nearly N. and S., and in Northern and Central Queensland N.W. and S.E., with occasional N. and S. folds. Mr. Jack writes to me—"The folding of the Gympie formation must have been the chief factor in the evolution of the eastern coast range. That it took place before the deposition of the Star formation I have little doubt in my mind, as the latter, though nowhere observed in contact with the Gympie, is comparatively undisturbed." The folding therefore probably took place some time anterior to the existence of the *Glossopteris* flora in Australia, the earliest traces of which have been found in Permo-Carboniferous rocks, as the Permo-Carboniferous strata are for the most part only gently inclined.

The Carboniferous rocks of the Kimberley District in West Australia have been tilted locally but not folded.

C. Lower Bowen Formation.—This formation in the type district in Queensland consists of coarse volcanic agglomerate and conglomerate capped by yellow siliceous sandstone and soft sandstone, the aggregate thickness being about 1000 feet. These are capped by the interbedded porphyrites and basalts, typically developed at Mount Toussaint and Mount Devlin. The exact thickness of these contemporaneous lavas is not stated by Mr.

Jack,* but his sketch section would lead one to infer that the thickness is probably between 500 and 1000 feet.

In New South Wales the strata which immediately underlie the Lower Marine Series (Permo-Carboniferous) and overlie the *Lepidodendron veltheimianum* beds may be homotaxial. In the Stroud District they attain a thickness of over 5000 feet. They consist of tuffaceous conglomerates, basic and felsitic tuffs, with some contemporaneous lavas, purple shale, and cherty shales containing abundant *Rhacopteris.*

Summary of Carboniferous Period.—In the present state of our knowledge we are unable to correlate accurately the Carboniferous formations of Australia, nor is it probable that they admit of accurate correlation, though they may be ranged in homotaxial groups. For the first time in the geological record of Australia terrestrial and freshwater formations play an important part. The Gympie series represents sediments laid down in seas of moderate depth for the most part, but in the New England district of New South Wales possibly the red jasperoid shales of the Nundle and Bingara districts with the associated serpentines may represent altered abysmal deposits, as has been suggested by Captain Hutton for similar rocks in the Maitai Series of New Zealand, unless the red claystone represents rock locally metamorphosed where in contact with the serpentines. The greatest palæontological interest centres in *Lepidodendron australe* and its allies in the contemporaneous flora. That this plant had a considerable vertical range is certain, for it has been found associated with Upper Devonian or Carbonifero-Devonian fossils at Mt. Lambie, in New South Wales; it is found in the marine Gympie series at Gympie, and at the Hodgkinson goldfield in Queensland, and ranges through that series to the top of the Star series, and throughout a considerable thickness of rocks at Barraba and Goonoo Goonoo in New South Wales, which are probably newer than the Gympie Series. It is therefore very difficult to correlate terrestrial or freshwater deposits in Australia by the aid of the distribution of *Lepidodendron australe* alone.

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*Report on the Bowen River Coalfield, by R. L. Jack, Government Geologist. By authority. Brisbane, 1879. p. 4.

In Queensland land must have existed in Gympie time as the drift specimens of *Lepidodendron* in the series of that age prove. Contemporaneous volcanic eruptions took place producing basic amygdaloids and tuffs. *Cordaites australis*, McCoy (?), is found in association with *Lepidodendron australe*. It will be recollected that both these forms occur in the Iguana Creek beds of Victoria, which are probably on a somewhat lower horizon than the Avon River sandstones, and they may possibly be on the same horizon as the Gympie. It must be remembered, however, that there is an enormous gap in Queensland between the Middle Devonian and the Gympie, not one single species of the Middle Devonian, ascending into the Gympie Series ; and although there is also an enormous gap in Victoria as indicated by the strong unconformability between the Avon River sandstones (Carboniferous ?) and the Tabberabbera shales (Middle Devonian), in the absence of marine fossils from the *Lepidodendron* Series of Victoria it is by no means certain that the interval of time represented by the physical break, the unconformability in Victoria, is greater than that indicated by the biological break in Queensland.

In the Star Series of Queensland, which succeeds the Gympie, the strata are partly marine, partly freshwater, and partly volcanic. The earliest foraminiferal limestones known in Australia occur in these beds, and abundant remains of *Palæoniscid* fish. *Lepidodendron australe*, McCoy, *L. veltheimianum*, *Calamites varians*, Germar, *Cyclostigma australe*, Feist., (?) *Stigmaria* sp. ind., Tenison-Woods, and *Cordaites australis*, McCoy, form the chief constituents of the flora. In Queensland, as in New South Wales, it will be observed that *L. australe* appears to have preceded *L. vel theimianum*, a fact already commented upon by Mr. Clunies Ross.

The *Rhynchonella pleurodon* occurring abundantly in the Star beds suggests a relation between them and the *Rhynchonella pleurodon* beds of the Clyde Mountain, near Braidwood, in New South Wales, in the lower representatives of which *Lepidodendron australe* is met with.

That contemporaneous volcanic eruptions took place during the Star epoch is proved by the interbedded amygdaloidal dolerites and porphyrites, the latter containing large masses of native copper. It is just possible that these eruptions may have belonged to the same period as that of the contemporaneous melaphyres and red shales in the Avon River rocks of the Victorian *Lepidodendron* Series. In Eastern Victoria the *Lepidodendron* Series is largely composed of contemporaneous volcanic rocks, *Lepidodendron australe*, *Archæopteris* and *Rhacopteris* occurring higher up in the series. In New South Wales the formation in which *Lepidodendron* has been found in the Northern Districts is probably on the horizon of the Star Series, as the strata, with which it is associated, appear to be less folded than those of the adjoining Gympie Series. In the Stroud District of New South Wales *Lepidodendron veltheimianum* and *L. volkmannianum* are found in association with *Rhacopteris* on a horizon at least as high as that of the Star Series, and the upper portion of this series, which contains *Rhacopteris* and *Calamites* alone, associated with basic and felsitic tuffs and basic and felsitic lavas, is perhaps newer than any portion of the Carboniferous formations known in Queensland or Victoria, except the Lower Bowen Series.

In New South Wales *Rhacopteris* clearly survived *Lepidodendron* during the volcanic epoch which closed the Carboniferous Period in New South Wales.

In West Australia in the clear water of a sea of moderate depth, and shallow occasionally, as proved by the lenticular beds of gypsum and traces of rock salt, magnesian limestone and ordinary limestone were formed, the fossil marine fauna of which show them to be homotaxial with the Carboniferous limestones of Europe. Lacustrine and terrestrial conditions succeeded, attended by a luxuriant growth of *Calamites* and *Lepidodendron*, but there, as in Eastern Australia, the *Lepidodendron* Period was not marked by the formation of any seams of coal.

It is evident that in Carboniferous times the land area of the Middle and Upper Devonian was probably considerably increased, and Western Australia was perhaps united to Eastern Australia, but in the absence of a description of the varieties of *Lepidodendron* met with in West Australia, this cannot be considered an established fact. It is certain, however, that at the close of the Carboniferous Period in Australia the Main Dividing Range of Eastern Australia occupied approximately its present position, and in places, as near Mount Lambie, the land probably stood far higher than it does now, as proved by the great anticlinal curves, now deeply denuded, though still in places between 3000 and 4000 feet above sea-level. In Tasmania Carboniferous deposits and *Lepidodendron* are wholly wanting as far as known at present, but it must be remembered that much of that island, especially the western area, has not yet been geologically examined in detail. There is no proof at present that this *Lepidodendron* Flora ever reached either Tasmania or New Zealand.

GENERAL SUMMARY.

The observations recorded in the above paper, if correct, and I have done my best to try and arrive at the truth, may warrant the following conclusions:—In Pre-Cambrian (Archæan) time strata were deposited remains of which have been preserved, (1) in Tasmania, (2) near Adelaide, (3) in the Mount Macdonnell Ranges, (4) in the Kimberley District of Western Australia, and (5) perhaps in the Southern Island of New Zealand. The best evidence for the Pre-Cambrian age of this group has been obtained in Yorke's Peninsula, near Adelaide, where the Archæan rocks are strongly unconformable to the *Olenellus-Salterella* zone of the Lower Cambrian Series.

The beds of limestone and dolomite at the Macdonnell Ranges in South Australia, interstratified with the Archæan rocks, and the graphite and contemporaneous (?) ironstone are strongly suggestive of contemporaneous life in Pre-Cambrian times in the Australasian region, and the high differentiation of animal life in the succeeding Lower Cambrian rocks points to the same conclusion. Before the Lower Cambrian rocks were deposited in Yorke's Peninsula and the Mount Macdonnell

Ranges, the Archæan sediments were strongly folded. The axes of the folds in North Western Tasmania strike N. 25° W. towards the Western portion of Victoria, and trending towards Leigh's Creek, in South Australia, where north-westerly axes of folds are strongly developed in the Cambrian rocks. A short distance S.W. of Silverton these north-westerly axes of folding meet almost at right angles a strong N.E. and S.W. axis, the Adelaide Axis, which runs from Yorke's Peninsula to beyond Silverton. Following the north-westerly axis, which may be termed the Tasmanian Axis, towards the Musgrave and Macdonnell Ranges, the strike changes to due E. and W. There is evidence there too, as at Yorke's Peninsula, to show that the folding of the Archæan rocks was Pre-Cambrian, as there is an unconformability between the Archæan group and the Cambrian system. From the west end of the Macdonnell Ranges, it would seem that the Archæan folds swing once more back on to their former bearing; as in the Kimberley District there are strong N.W. and S.E. folds in the Archæan group, with, however, a N.E. axis crossing it and striking towards the Ord River. No conclusive evidence has been obtained to show when this folding took place at Kimberley, but it was probably chiefly Pre-Cambrian. In Tasmania the general evidence shows that the folding of the Archæan was earlier, at all events, than Upper Cambrian, as the Caroline Creek beds, of the latter age, are considered unconformable to the Archæan group.

The general features of the axis of folding in Archæan time in Australasia appear to be as follows:—A long shallow loop, like a railway curve, commencing in Tasmania and trending thence to the Macdonnell and Musgrave Ranges, the convexity of the curve facing N.E., then a reverse curve from the Macdonnell Ranges to Kimberley. To the S.W. of Silverton, this doubly curved Tasmanian Axis is crossed by the Adelaide Axis from S.W. to N.E.

This powerful folding in Pre-Cambrian time, considered in conjunction with the fact that in the Pre-Cambrian as well as in the succeeding Cambrian System there are conglomerates and ripple marks (?) indicative of shallow water conditions, render it probable that there was land in Australia in Archæan time, the twilight of geological history. No evidence has yet been obtained in Australasia to prove unconformabilities in the Archæan Group, as has been done in North America and Canada, where the Pre-Cambrian Group contained in the Algonkian and Fundamental Complex is now known to comprise no less than four unconformable systems. In the succeeding Lower Cambrian formations, typically developed at Yorke's Peninsula, a highly interesting contemporaneous marine fauna is developed, with the character of which the labours of Professor Tate and Mr. R. Etheridge, junr., have now made us well acquainted. No less than four or five of the seven subkingdoms of the animal kingdom are represented in that life zone, which in Australia, as well as in Europe and North America, is characterised by the trilobite *Olenellus*, and the pteropod *Salterella.*

In the Macdonnell Ranges Mr. H. Y. L. Brown's evidence shows that the Cambrian sediments were folded partially at all events before the deposition of the succeeding Lower Silurian sediments. The axes of folding of the Cambrian strata in Australia and Tasmania appear to have followed approximately the direction of the Tasmanian and Adelaide Axes.

The frequency of conglomerate beds in the Cambrian rocks of South Australia implies probable proximity of land. In New Zealand the Pre-Silurian schists and other crystalline rocks of the North-West end of the South Island and in Otago were folded along the N.E. and S.W. axes chiefly, swinging round to S. and S.S.E. at the S.E. end of the South Island, as shown by Captain Hutton. The close of the Cambrian Period, therefore, in Australia witnessed the second folding to which the earth's crust in Australia was subjected. This second folding probably increased the land area, as the next system of rocks, the Silurian, covers an extensive superficial area and attains in places an enormous thickness, which implies an extensive land surface, from the denudation of which its materials were derived. The superficial area covered by Cambrian rocks in Australia and Tasmania, as far as at present known, is perhaps not more than about 10,000 square miles, about $\frac{1}{300}$ of the whole area of Australia and Tasmania.

Lower Silurian rocks have been identified in Victoria, Tasmania, Central South Australia, and New Zealand. They are characterised by abundant graptolites, and trilobites, with the addition, in Tasmania, of corals and cephalopods. Ripple-marked sandstones and conglomerate beds indicate shallow water conditions for their accumulation in Tasmania, and at the Mount Macdonnell ranges conglomerates indicate similar conditions, temporary cessation of sedimentation on deepening of the ocean being marked by beds of limestone. In New Zealand, on the other hand, the Lower Silurian sediments may have accumulated in seas of some depth.

The amygdaloids of Wooltana and the Mt. Arrowsmith Ranges in South Australia may represent contemporaneous volcanic outbursts. The folding in Tasmania was on axes N. by W. and N.N.W., in Western Victoria on N.N.W. axes, and in the Macdonnell Ranges on E. and W. axes.

It was perhaps during this epoch that a third axis commenced to develop which may be termed the Kosciusko Axis having approximately a meridional trend. There was probably land at this time in the Southern portion of the Cordillera region of New South Wales, and in Victoria, Tasmania, and South and West Australia. In New Zealand the Lower Silurian were folded on the same axes as the Pre-Silurian following for the most part the trend of the Southern Island, but the date of the folding in New Zealand cannot be determined further than that it took place before the Carboniferous or Permo-Carboniferous Period.

Rocks of Upper Silurian age are known to exist in Tasmania, Victoria, New South Wales, and possibly in New Zealand. In Victoria their thickness added to that of the Lower Silurian has been estimated by Mr. Selwyn as 35,000ft. The sun-cracked flaggy sandstones in the Yass district of Upper Silurian Age prove conclusively that there was some land in the southern portion of New South Wales during that epoch. The missing sub-kingdoms of the animal kingdom, the Echinodermata and the Vertebrata, are made up respectively by the abundant crinoids and starfish of the Victorian rocks and the spine of a fish, probably *Onchus*, found by Mr. W. Anderson in the limestone of the Wellington Caves in New South Wales. The well known Silurian Coral *Halysites* occurs in several localities in New South Wales. In Victoria these Upper Silurian strata were strongly folded along N.W. and S.E. axes principally, following the Tasmanian Axis, which perhaps had altered in direction slightly, becoming more westerly in proportion as the Kosciusko Axis became more pronounced. In New South Wales folding took place along axes approximately meridional. In Victoria the folding antedated the commencement of the next geological period, the Devonian, and in New South Wales it partly, at all events, preceded Upper Devonian time. This is now the fourth folding of the Australian rocks, or as the folding was only slight in the Lower Silurian rocks before the deposition of the Upper Silurian rocks, it may be considered as the third important folding.

The earliest freshwater deposits known in Australasia are recorded by Mr. R. M. Johnston as occurring in the Fingal District of Tasmania, where an *Anodonta* (?) has been discovered.

In Lower Devonian time in Victoria there were extensive eruptions, as described by Messrs. A. W. Howitt and R. A. F. Murray, of lavas and tuffs of an acidic character, the products of a chain of large volcanoes, of one of which the Cobboras, 6000 feet high, form the denuded stump. This volcanic series is known as the "Snowy River Porphyries," and is, perhaps, about 4000 feet thick. The volcanoes which produced them are considered by Mr. Howitt to have established themselves upon a meridional fissure parallel, therefore, to the Kosciusko Axis.

Middle Devonian rocks are represented in Victoria by the Buchan and Bindi limestones and some underlying tuffaceous beds, the thickness of the whole series being about 1300 feet. The Tabberabbera shales also belong to the same horizon. The South Eastern portion of Victoria was submerged to the extent of at least 3000 feet during this period. Remains of the bony-plated Coccostean fish are plentiful in the Buchan limestone, and have been described by Professor McCoy. In New South Wales Middle Devonian rocks are doubtfully represented by the Coodra Vale and Cave Flat limestones, near the Murrumbidgee, in the Yass District, where remains of Coccostean fish have been obtained.

In Queensland the Burdekin formation, of Middle Devonian Age, is estimated by Mr. R. L. Jack to be upwards of 20,000 feet in thickness, and comprises an ancestor of the Barrier Reef of Australia in the form of a massive bed of coralline limestone 7000 feet in thickness in places. Some of the sandstones in this formation are crowded with suncracks. A few beds of contemporaneous volcanic ash are interstratified. The oldest known terrestrial plant from Australasia [a *Conifer (?)*], *Dicranophyllum Australicum*, Dawson, has been discovered in the Burdekin strata. In the Kimberley District of Western Australia the late Mr. E. T. Hardman, the discoverer of the Kimberley Goldfields, describes Devonian rocks exceeding 10,000 feet in thickness. In New Zealand Captain Hutton groups in his Tákaka system all the sediments between the Lower Silurian and Devonian, and assigns to this system, as developed in Otago, the astonishing thickness of 100,000 feet, that is about 19 miles. As the lowest of these strata are now visible at the earth's surface, and do not show evidence, in spite of their having been buried to such a depth, of having been liquefied, they afford interesting proof as to the probable minimum thickness of the earth's crust, and their evidence agrees fairly well with that deduced from earthquake observations, which show that there is material in the earth's crust sufficiently solid to crack and so produce vibrations at a depth of 20 and even 30 miles; in one observed case, in America (the Owen's Valley earthquake), of 50 miles. There is no evidence of any land having appeared in New Zealand up to to the close of the Devonian Period. There is a singular absence of conglomerates and all indications of shallow water conditions. Indeed, in the next formation, the Maitai, some of the red jasperoid claystones are thought by Professor Hutton to represent abysmal deposits, the equivalents of the red clays of modern deep oceans.

There is no evidence of any Palæozoic Flora in New Zealand, and it may be doubted whether there was any land at all within the present area of New Zealand before the commencement of the Mesozoic Era when for the first time coarse conglomerates and a land flora make their appearance. Land must, of course, have existed in the neighbourhood of New Zealand, the denudation of which supplied the material for the Tákaka rocks. Portion of this may possibly be represented by the crystalline schists of Otago, but probably a considerable area of land lay to the west of the South Island, and has since been denuded away. The eruption of the rare ultrabasic rock dunite is noteworthy as occurring at the close of the prolonged sedimentation of the Tákaka system, according to the view of Sir James Hector. The axes of folding in Victoria in the Middle Devonian are very sharp, and their trend was still N.W. and S.E. In Queensland and in the Kimberley District N.E. and S.W. strikes predominated. This is the fifth folding, or fourth important folding, of the Australasian rocks. In Victoria the folding, preceded almost entirely the deposition of the Lower Carboniferous rocks, and at Kimberley preceded the Carboniferous Period.

In the Upper Devonian or Carbonifero-Devonian rocks of Winburndale Creek, near Bathurst, and at Mt. Lambie, near Rydal, Upper Devonian Beds occur with abundant *Spirifera disjuncta* and *Rhynchonella pleurodon.* The earliest type of *Lepidodendron australe* was found last year by Mr. Clunies Ross, of Bathurst, Mr. E. F. Pittman, the Government Geologist, and myself in those beds. The classification and correlation of the Carboniferous rocks of Australia is complicated and is still nebulous. In Queensland, where the group has been best worked out, there are at least two well marked divisions, the Gympie and the Star, which I think may be referred for purposes of comparison to the Carboniferous Period, although included by the Queensland geologists under the term Permo-Carboniferous. They have not a single species in common with the Burdekin formation (Middle Devonian). The Gympie, the older division, is developed in New South Wales as well as Queensland. It contains *Cordaites*

Australis, McCoy, and *Lepidodendron australe*, McCoy. Both of those plants are also found associated with a marine fauna, *Productus cora, Protoretepora ampla, Martinia subradiata*, in the Iguana Creek Series of Victoria, which may be homotaxial with the Gympie Series. Interstratified tuffs and lavas occur in the Gympie Series at Gympie, and also in the Iguana Creek Series as developed on the Avon River in Victoria. In the Hodgkinson Goldfield, in Queensland, the Gympie Series is 20,000 feet thick.

No *Lepidodendron* is as yet known to have been found in the Gympie in New South Wales.

The Gympie rocks have been strongly folded along the Kosciusko Axis, which at the close of the Gympie epoch appears to have extended itself across the New England District of the northern portion of New South Wales, and into Queensland at least as far north as the Palmer Goldfield. The folding took place chiefly before the close of the Carboniferous Period, as the Star Series, which overlies the Gympie, is far less folded than the latter. The folds strike N.N.W. chiefly, in New England, N. and S. in the type district at Gympie, and N.N.W. to N.W. in Central and Northern Queensland. Mr. Jack considers that the folding of the Gympie was the chief factor in the evolution of the Main Dividing Range of Queensland, as it certainly was in that of the New England District of New South Wales. At the close of the Gympie epoch the Main Dividing Range of Eastern Australia probably occupied approximately its present position, but was situated further west in New South Wales than it is at present and probably was much higher. In the next formation, the Star, there is evidence of an abundant land flora, comprising *L. veltheimianum* in Queensland, in addition to *L. australe, Cyclostigma Australicum, Calamites varians, Cordaites Australis*, McCoy, and *Stigmaria* (?), Tenison-Woods. A similar flora occurs in New South Wales, but in addition the fern *Rhacopteris* is very abundant, especially in the Hunter District. The same fern occurs in similar strata in Victoria. It is abundantly associated with *Lepidodendron veltheimianum* in the Stroud District of New South Wales.

Either probably the Gympie Ocean, which covered New England previous to the great uplift of the granite masses, barred its migration into Queensland northwards, or it was a hardy form which flourished better in the cooler climate of New South Wales and Victoria than in the more tropical climate of Queensland; but the assumption that there was much difference of climate between these countries at so remote a period seems hardly warranted by this slender evidence.

The Star Series contains thick interbedded dolerites and porphyrites, the latter containing masses of metallic copper.

The abundance of *Rhynchonella pleurodon* in some of the Star beds suggests that they may be homotaxial with the *Rhynchonella pleurodon* sandstones of the Clyde Mountain, near Braidwood in New South Wales.

The Star beds are rich in remains of Palæoniscid fish, and contain thin foraminiferal limestones. The Star beds of Queensland are probably represented in New South Wales by the *Lepidodendron* beds of Barraba and Goonoo Goonoo. The Stroud beds of New South Wales, estimated by Mr. J. Mackenzie, F.G.S., Government Examiner of Coalfields, to be 10,000ft. thick, are probably higher than the Star Series, and are perhaps homotaxial with the Lower Bowen. They represent perhaps the latest deposits of the Carboniferous Period in New South Wales. Their upper portion is largely composed of volcanic ash and contemporaneous lavas. Evidence shows that in this locality *Rhacopteris* considerably outlived *Lepidodendron*. These rocks have been folded strongly in Post-Permo-Carboniferous time, but this folding is only local. It is nearly meridional, inclining slightly to west of north.

There is no proof as yet that *Lepidodendron* ever entered Tasmania.

In West Australia the massive carboniferous limestone described by Mr. E. T. Hardman and Mr. H. P. Woodward, F.G.S., is 1000 to 1300 feet thick, a pink to grey dolomite and ordinary limestone, containing *Productus cora, P. semireticulatus, Rhynchonella pleurodon*, &c. These limestones are capped by about

1500 feet of sandstones, containing undescribed specimens of *Lepidodendron*, *Lepidostrobus*, *Lepidophyllum*, *Sigillaria*, *Sagenaria*, *Calamites*, and *Cyperites*.

It is probable that Eastern Australia was united to Western Australia during some portion of the Carboniferous or of the Devonian Periods.

With regard to the inferences which may be deduced from the folding, it is clear that (1) the earliest known folding of the Australasian region took place in Pre-Cambrian time in Australia and Tasmania, and at least as far back as Pre-Silurian time in New Zealand. In Victoria, South Australia and Tasmania the original lines of folding along the Tasmanian and Adelaide Axes continued to be developed all through the Cambrian, Silurian and part of Devonian time, and along the Tasmanian Axis during portion, at least, of the Carboniferous Period. The Kosciusko Axis, however, would appear to be of somewhat later origin than the Tasmanian and Adelaide and New Zealand Axes. I would suggest tentatively that this axis became developed in the middle of the V-shaped area enclosed between the Tasmanian N.W. and S.E., and the New Zealand N.E. and S.W. axis, and in proportion as the Kosciusko Axis developed and extended itself into Queensland, so the Tasmanian Axis was less used for expending the contractile energy of the coast.

(2) Possibly an extension northwards of this Kosciusko Axis in Carboniferous time reclaimed for the Australian continent an area in New England, part of which had formed the floor of an ocean of moderate depth. The unfossiliferous dark clays with siliceous bands and jasperoid red claystones, with manganese in places, and belts of serpentine, may possibly represent deep sea deposits and associated eruptive rocks, and the siliceous bands might, with advantage perhaps, be searched for radiolaria.

(3) The burying of sediment under 19 miles of rock material was not sufficient in the case of the Tákaka system to bring about a liquefaction of the lower layers. This proves a considerable thickness for the solid crust, if it be assumed that the isogeotherms recovered their normal position before elevation ensued.

(4) At least five important foldings have taken place in the Australasian region between Pre-Cambrian and Carboniferous time inclusive, and each has had an important influence on the evolution of the continental area of Australia, but the last extensive folding, that of the Gympie, which took place in Carboniferous time, has been the chief factor in the evolution of the Main Dividing Range of Eastern Australia in the northern portion of New South Wales and in the greater part of Queensland.

(5) The folding along the New Zealand Axis which commenced in Pre-Silurian time was continued, as shown by Captain Hutton, up to the close of the Mesozoic Era.

In preparing the above address I have availed myself freely of the labours of others, but much as is due to each one of them I feel that most is due to a working member of this Society, Mr. R. Etheridge, junr., whose unremitting and systematic studies in the field of Australian Geology for the past thirty years are enabling us to correlate the geological formations of Australia on a sound and enduring basis. Through him the Linnean Society in the past has been identified with most of the important steps in the progress of Australian Geology, and that it should be so identified in the future is, I am confident, as much the wish of the present members of this Society as it was the wish of our generous founder.

EXPLANATION OF PLATES.

Plate XXVII.—Map showing the chief Directions of Folding at present known in Australia, Tasmania, and New Zealand. [The Anticlines of the New Zealand Folds are reproduced from the Sketch by Captain Hutton, F.R.S. (Quart. Journ. Geol. Sc. May, 1885, p. 195).]

Plate XXVIII.—Generalised Geological Sketch Section showing the successive Foldings of Australia from Pre-Cambrian Time to the close of the Permo-Carboniferous Period.

On the motion of Mr. Cecil W. Darley a very cordial vote of thanks was accorded to the President for his interesting Address.

The following gentlemen were elected

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VICE-PRESIDENTS:

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P. N. TREBECK, J.P.
THOMAS WHITELEGGE, F.R.M.S.
PROFESSOR J. T. WILSON, M.B., CH.M.

Mr. Hugh Dixson and Mr. Arnold U. Henn were elected Auditors.

The Auditors having been unable to complete their report in time the meeting then adjourned until April 25th.

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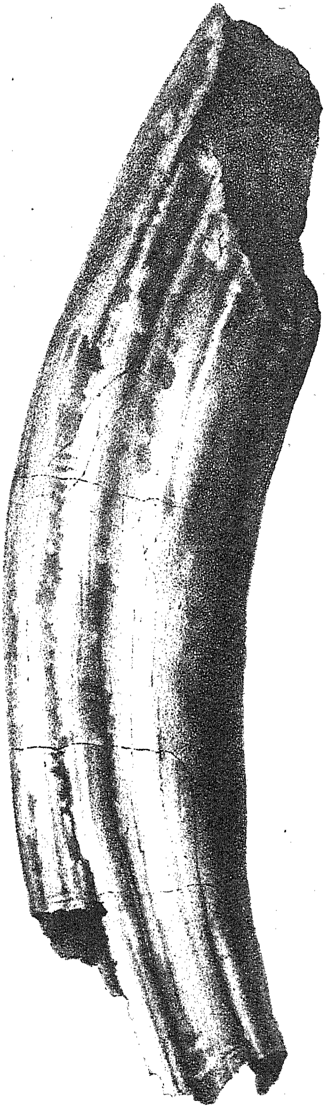

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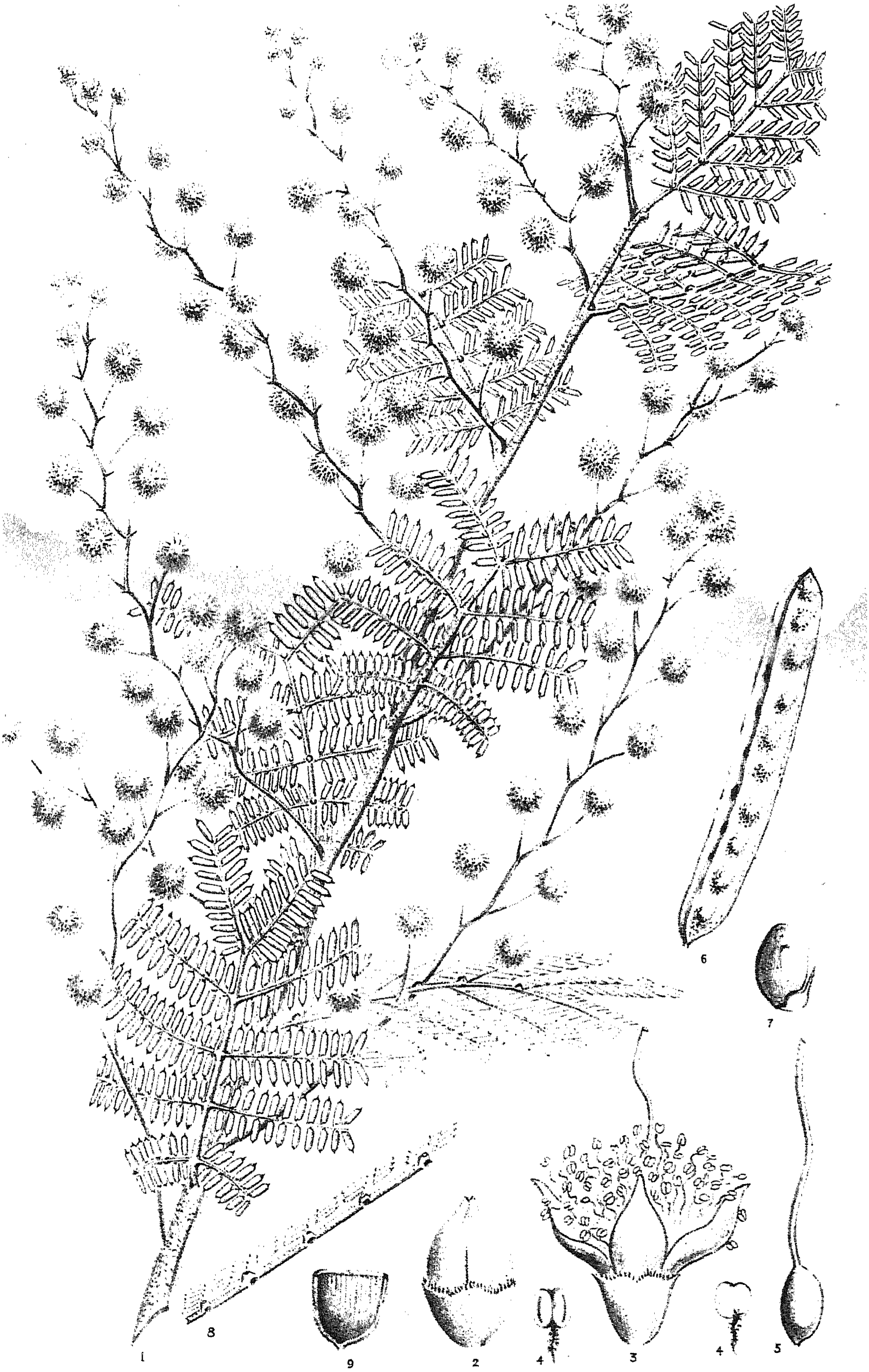

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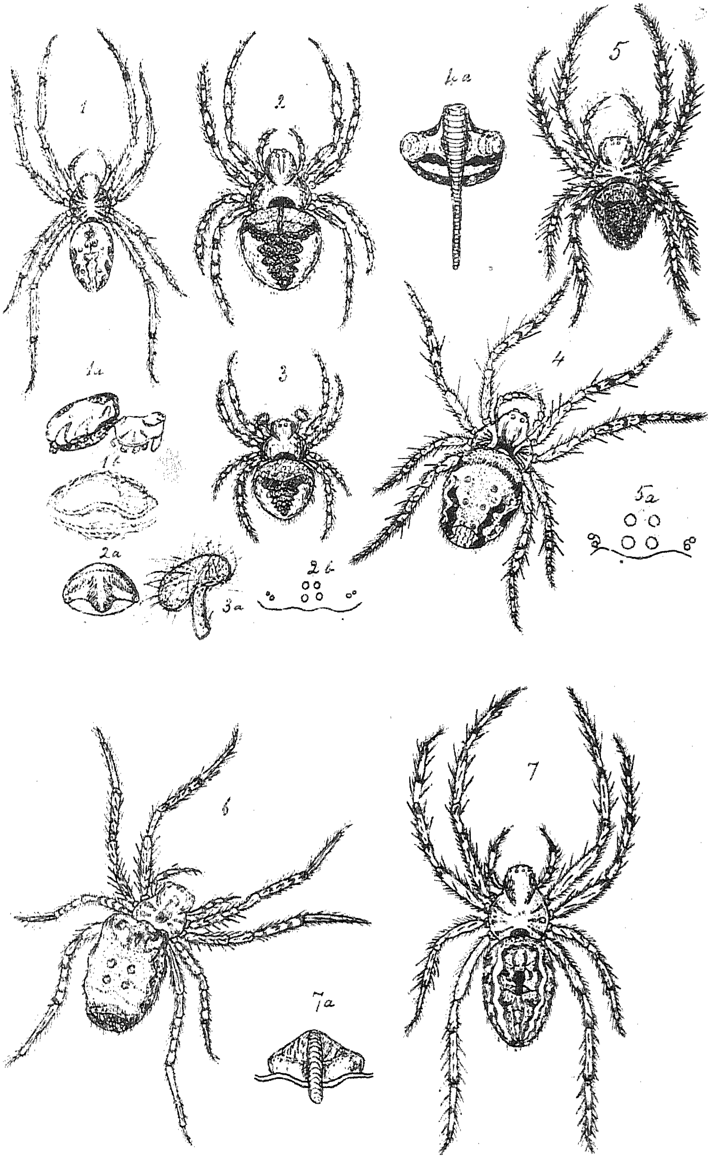

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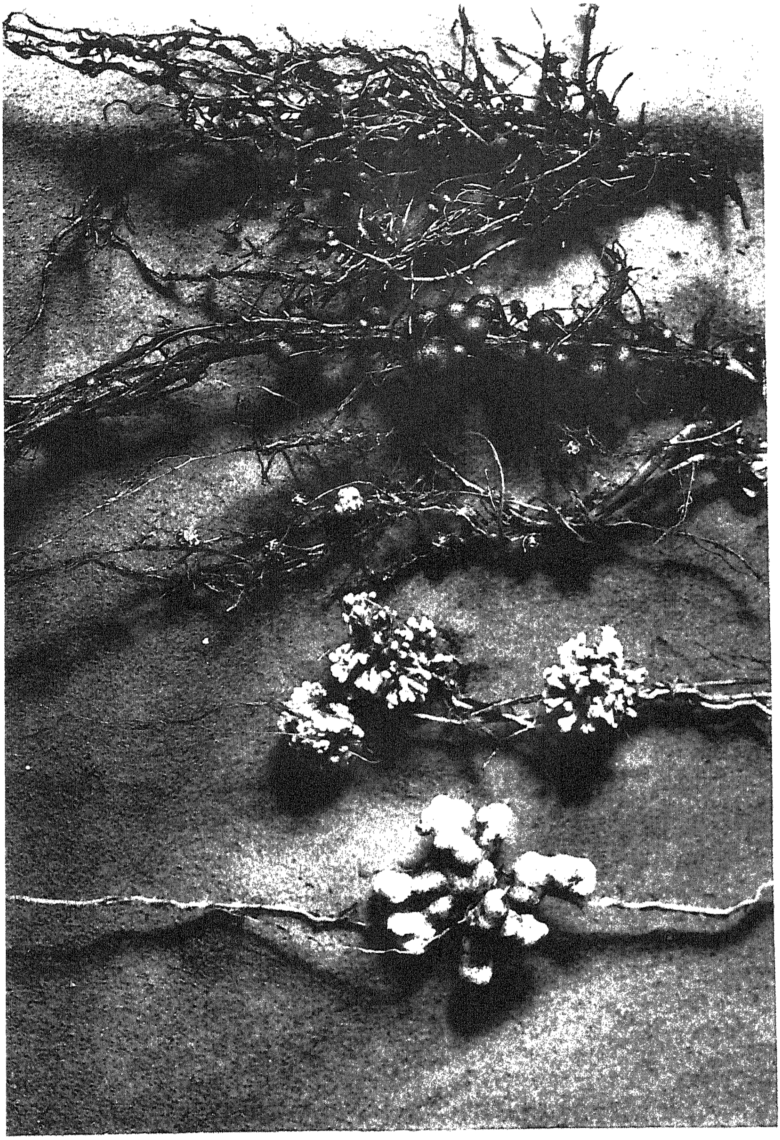

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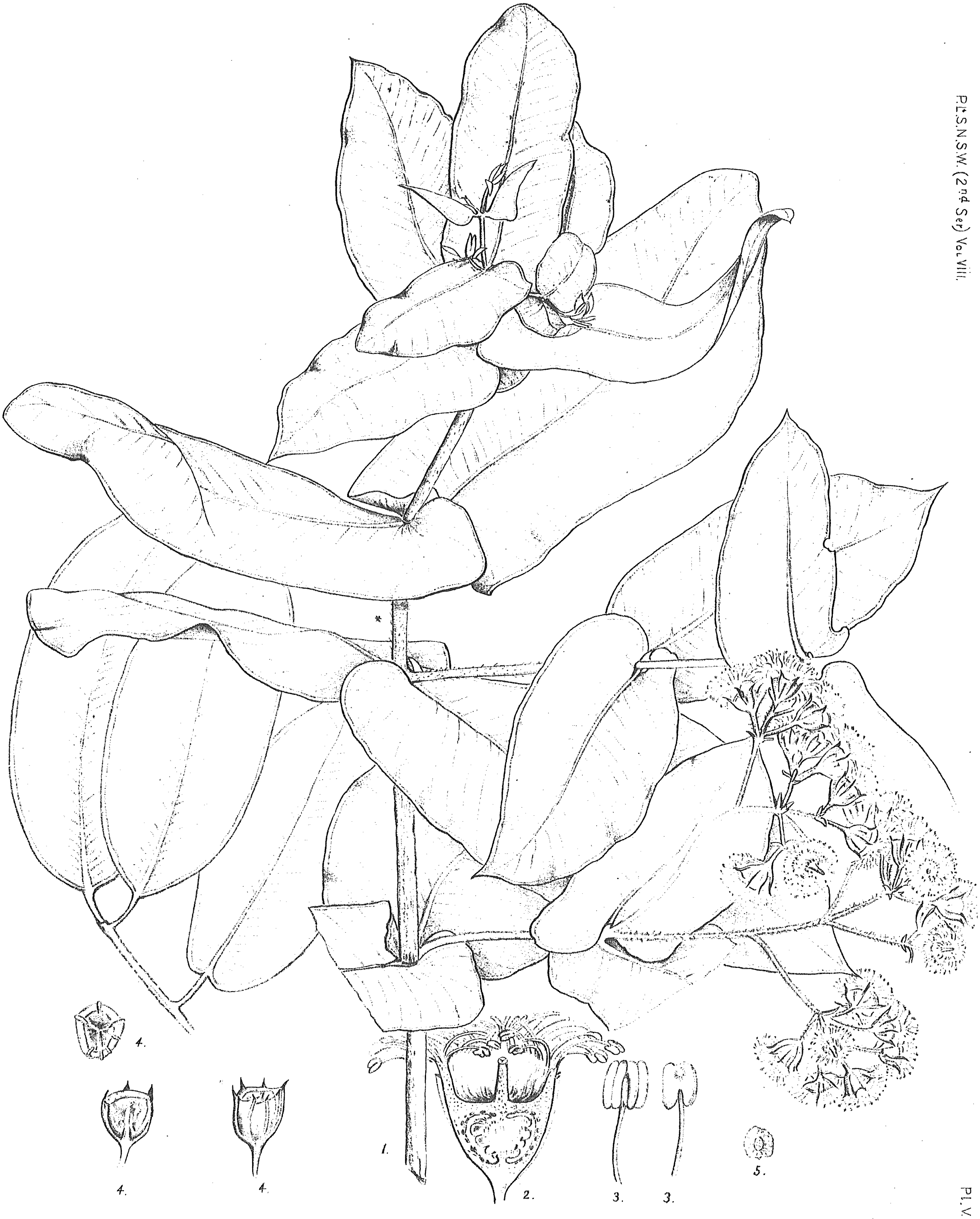

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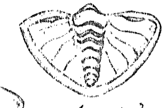
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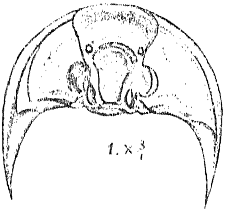
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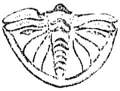
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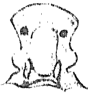
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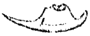
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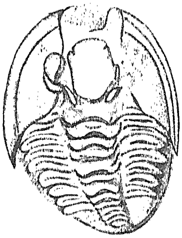
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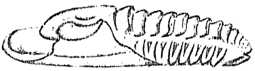
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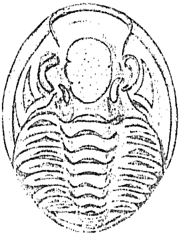
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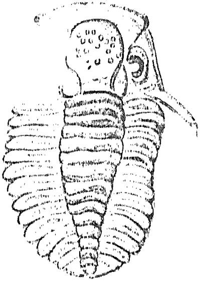
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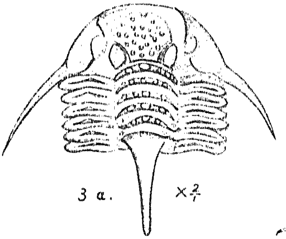
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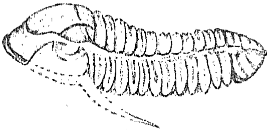
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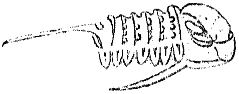
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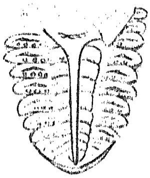
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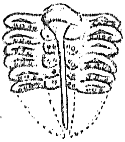
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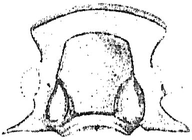
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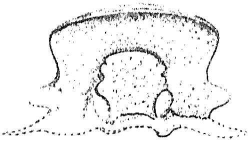
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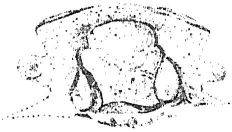
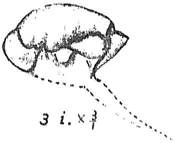
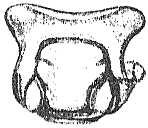

3 h. $\times \frac{3}{1}$

J. M. del.

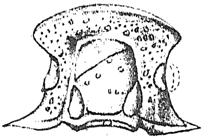
H. S. Burton, lith.



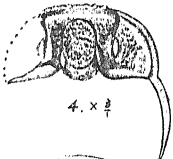
3 i. × $\frac{3}{1}$



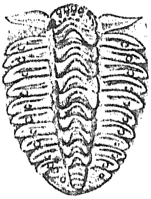
3 j. × $\frac{3}{1}$



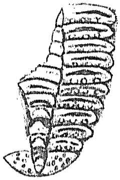
3 k. × $\frac{3}{1}$



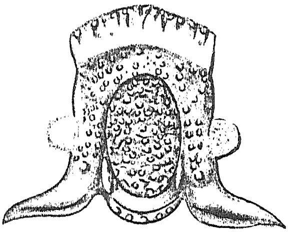
4. × $\frac{3}{1}$



4 a. × $\frac{4}{1}$

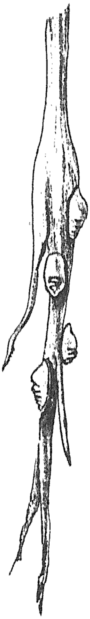


4 b. × $\frac{6}{1}$



4 c. × $\frac{6}{1}$

J.M del.



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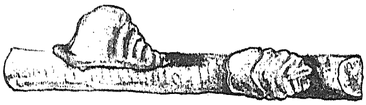

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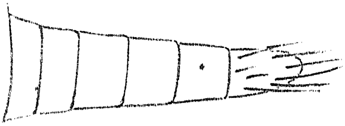

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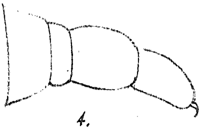


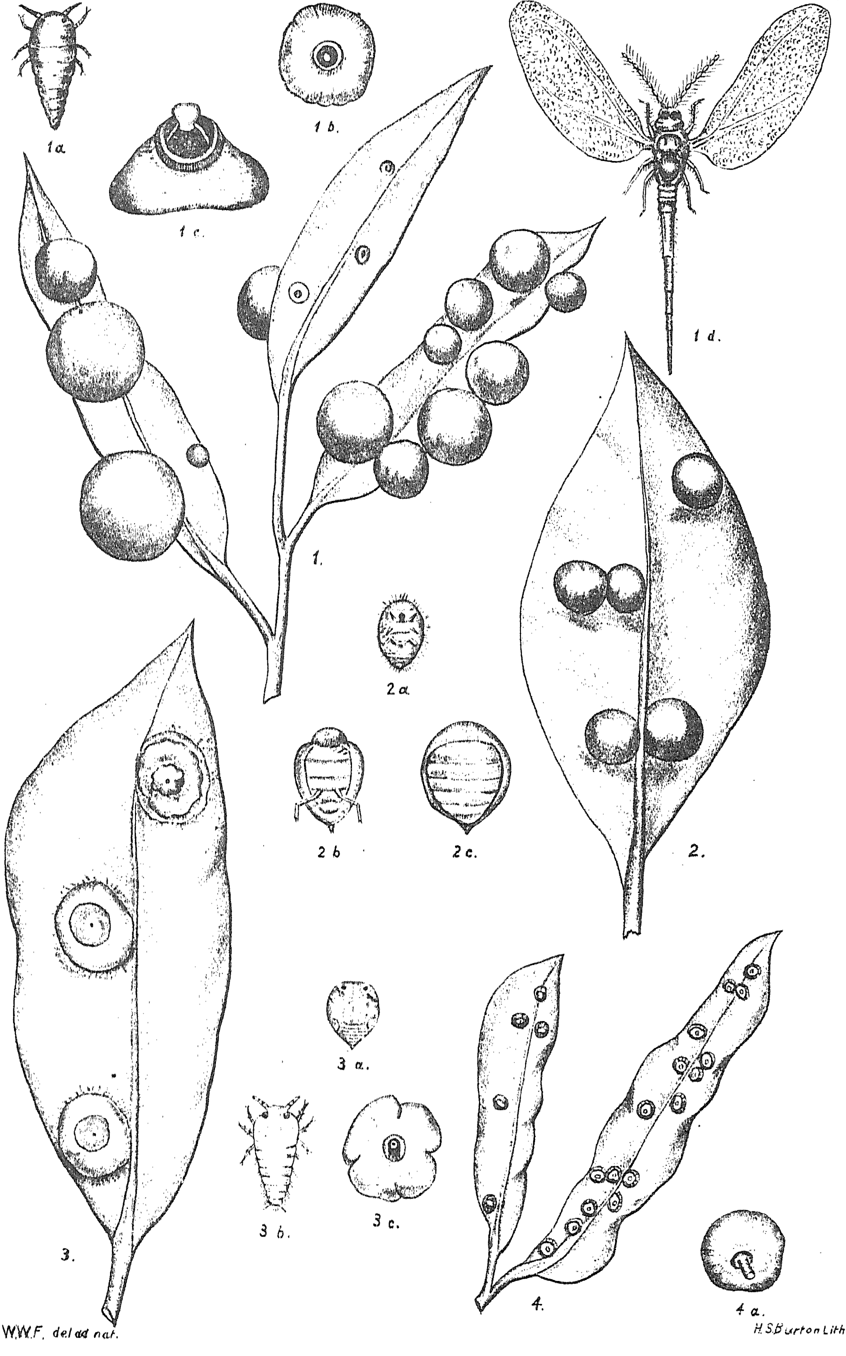
4.

W.M.M. del. ad nat.

H.S. Burton, Lith.

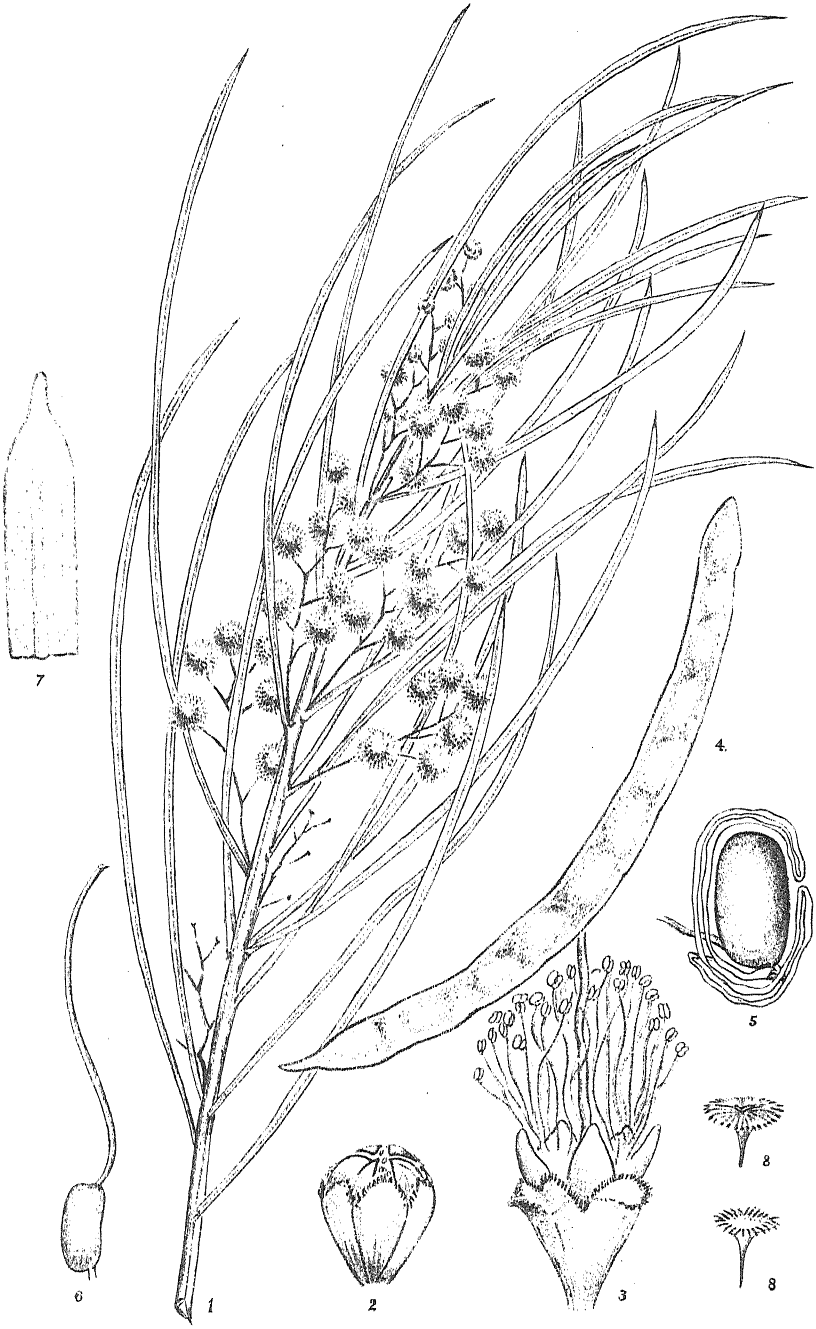
P.L.S.N.S.W. (2nd Ser) Vol. VIII

Pl. VIII.



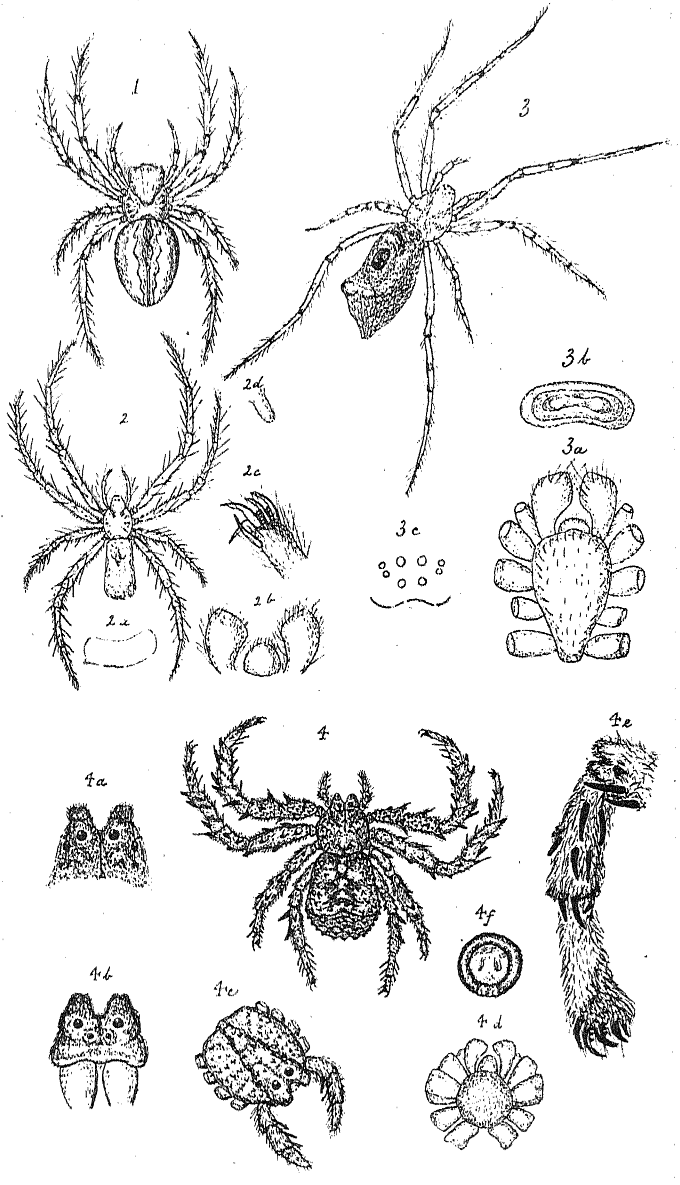
W.W.F. del ad nat.

H.S. Burton Lith.

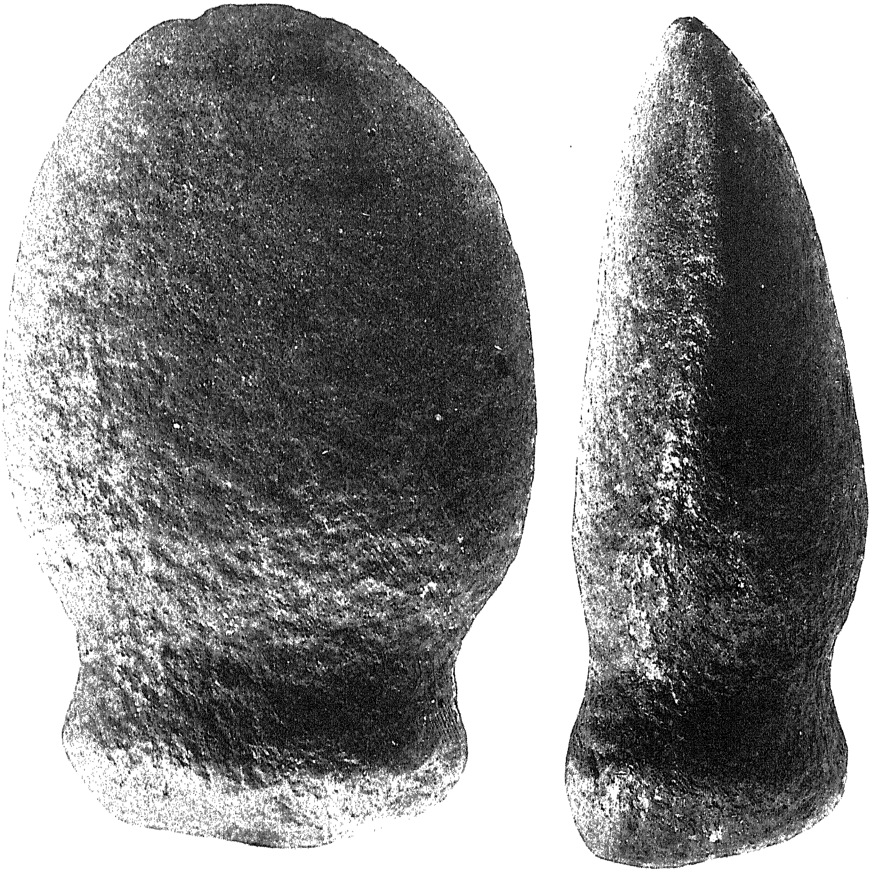


R.T. Baker, del. ad nat.   H.S. Burton Lith.

ACACIA SUBULATA, *Bonpl.*

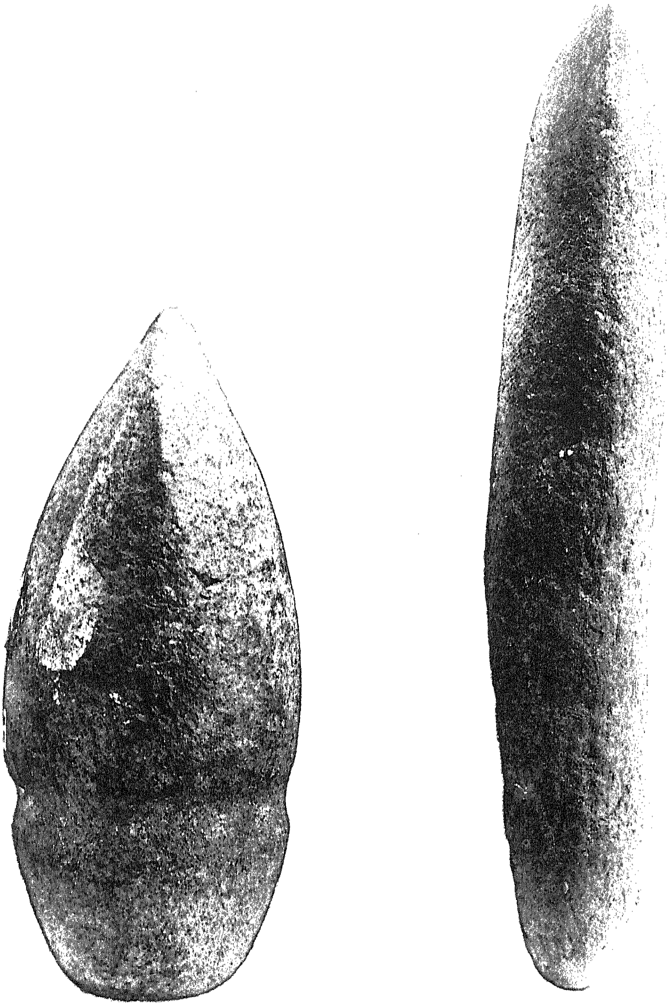


W.J.R. del.
Photoline Printing Co., Sydney.



AUSTRALIAN ABORIGINAL STONE WEAPONS.

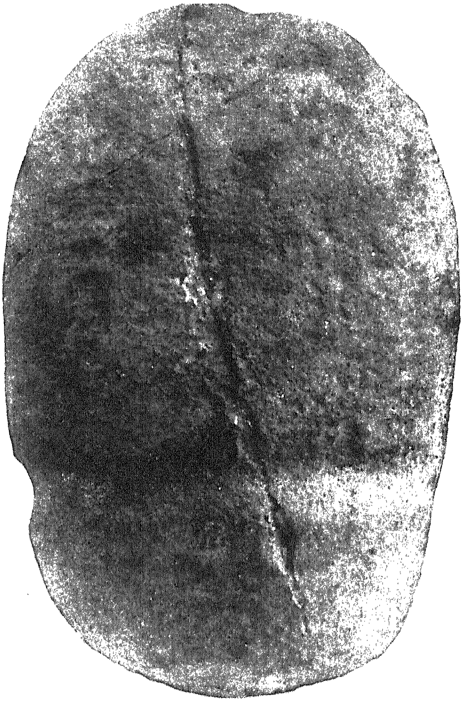
Photoline Printing Co., Sydney.



1. 2.

AUSTRALIAN ABORIGINAL STONE WEAPONS.

Photoline Printing Co., Sydney



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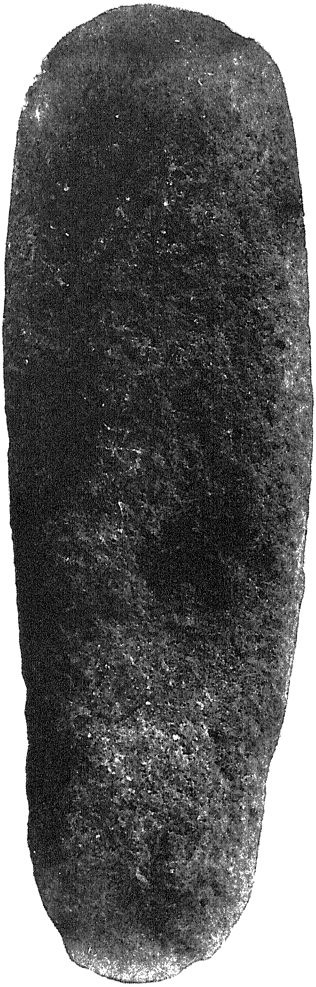

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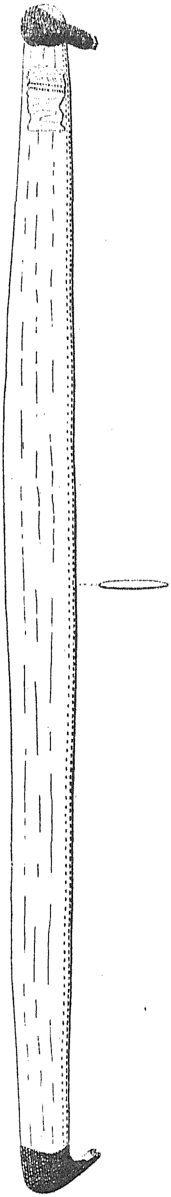
AUSTRALIAN ABORIGINAL STONE WEAPONS.

Photoline Printing Co., Sydney.



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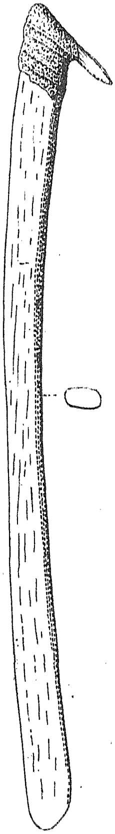

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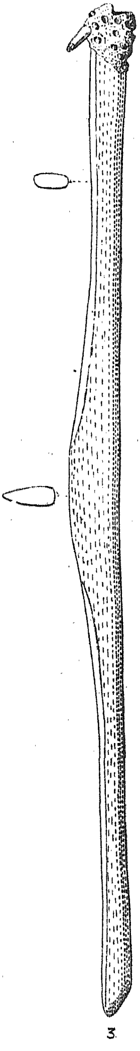


3

C.Hedly, del.

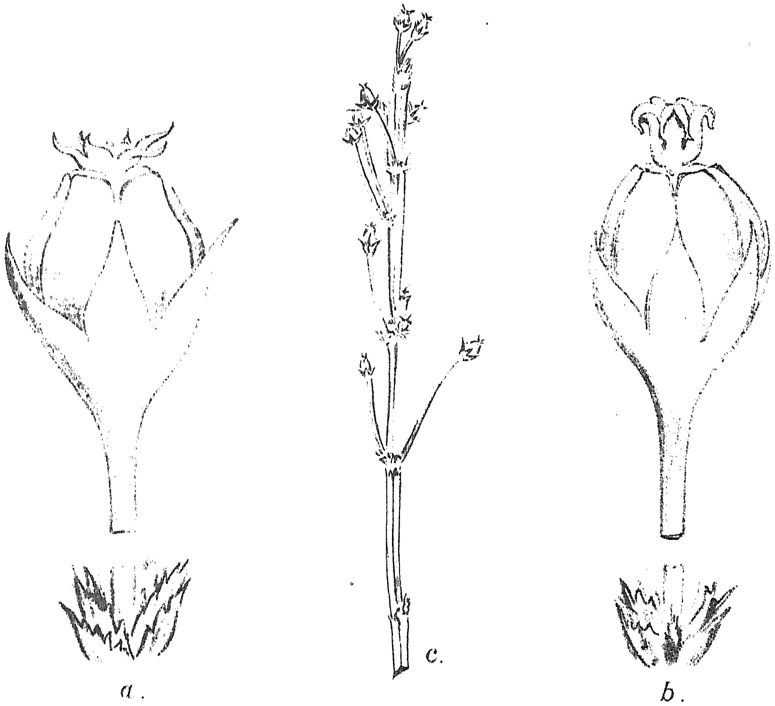


Fig. I.

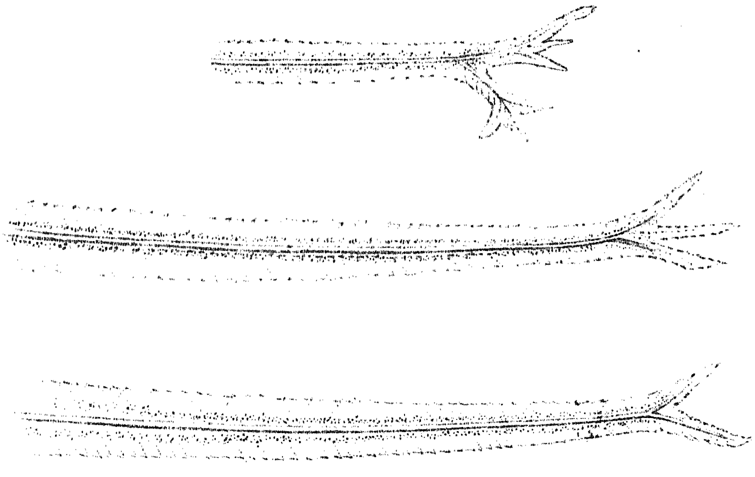
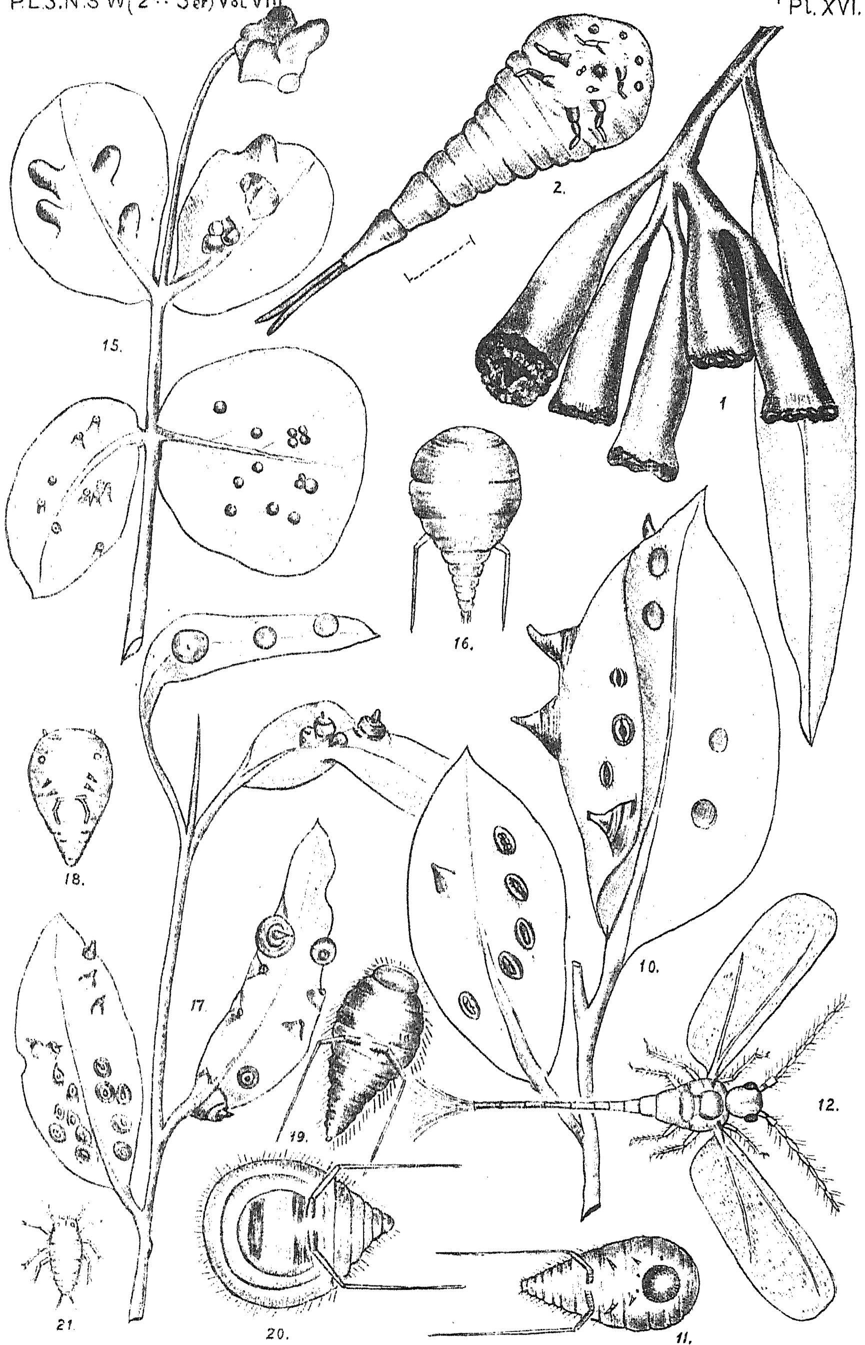


Fig. 2.

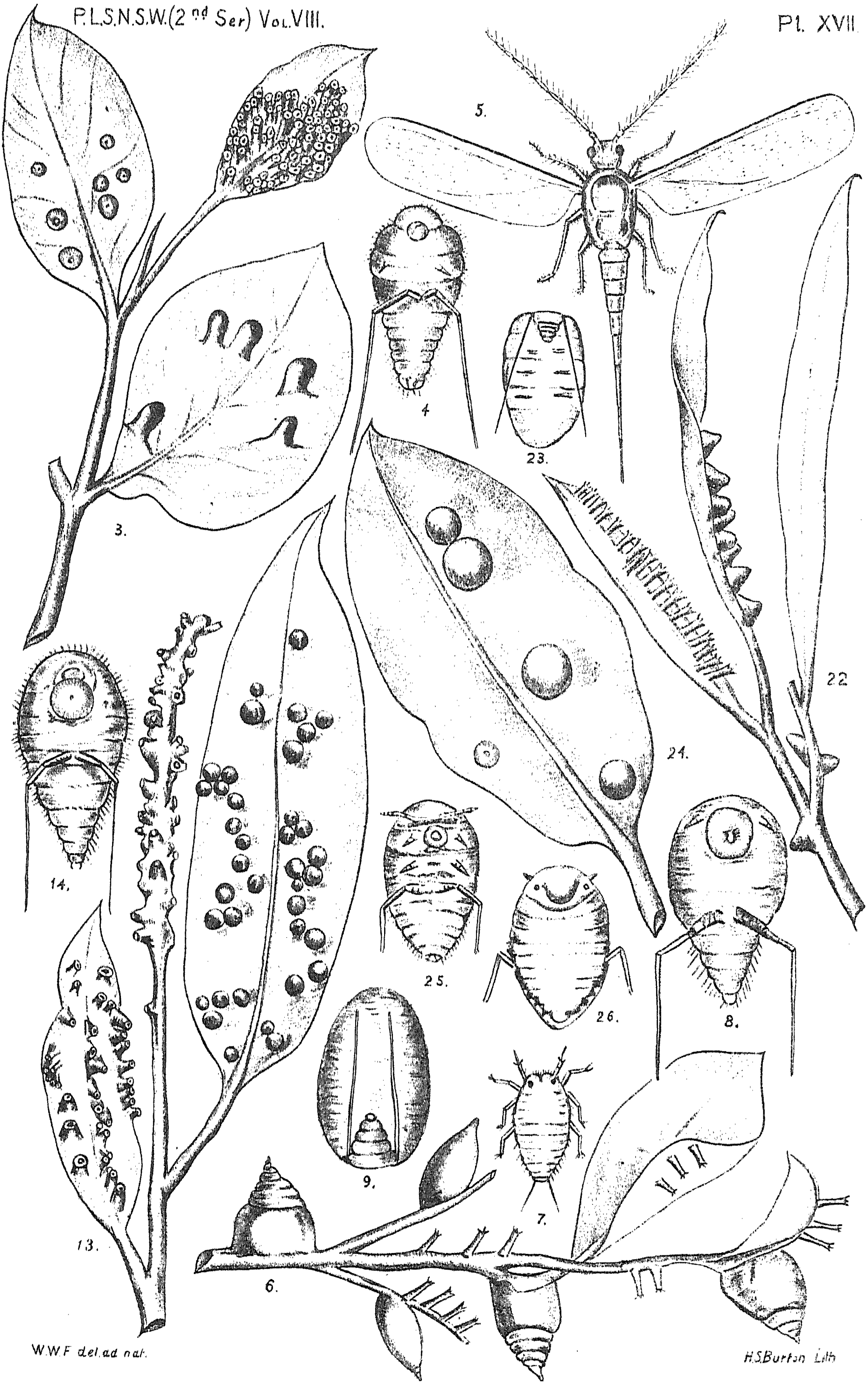
R.T.Baker, del.ad nat.
H.S.Burton, Lith.



W.W.F. del. ad nat.
H.S. Burton lith.

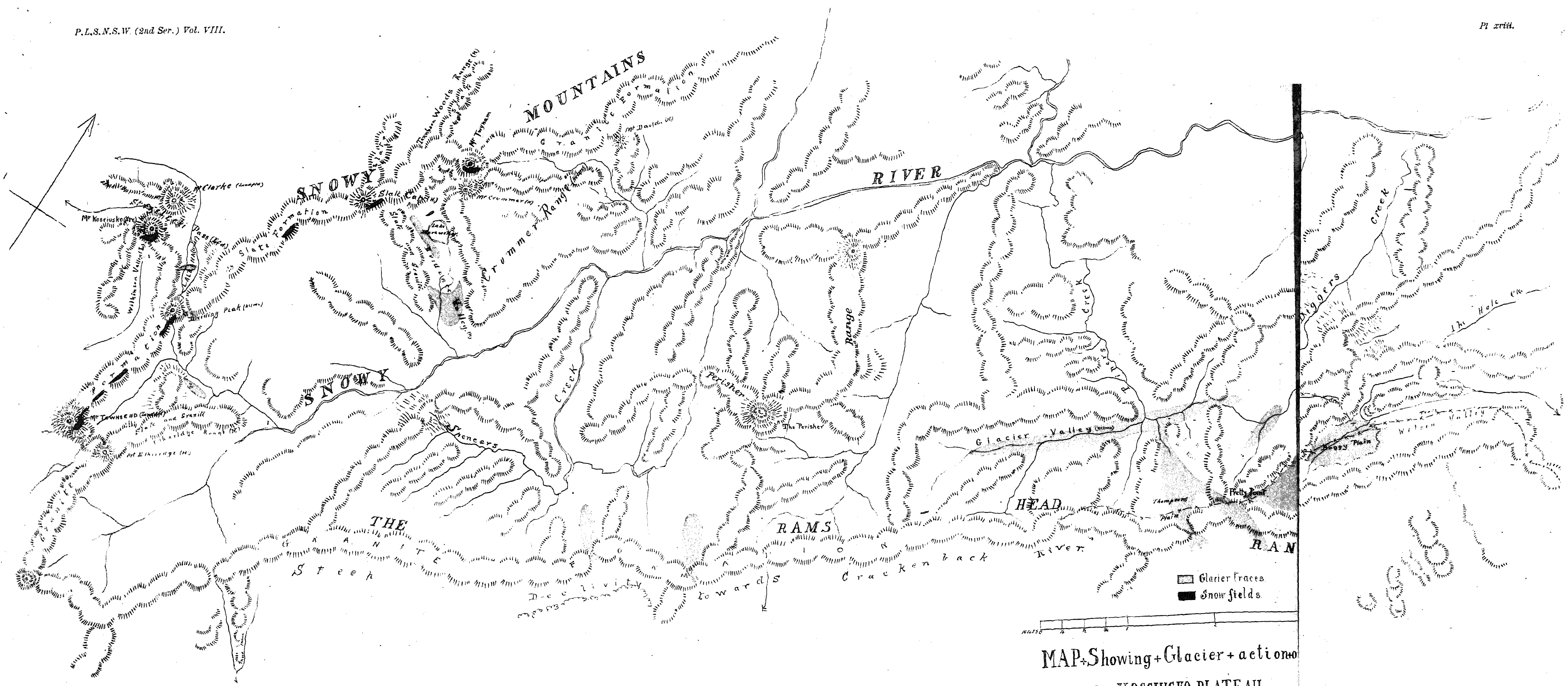
P.L.S.N.S.W.(2nd Ser) Vol.VIII.

Pl. XVII



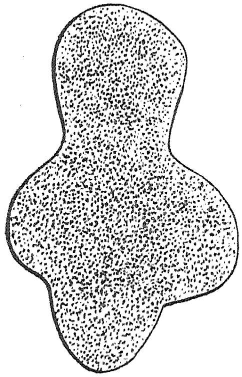
W.W.F del.ad nat.

H.S.Burton Lith



MAP Showing Glacier action on the KOSCIUSKO PLATEAU.

Photoline Printing Co., Sydney.



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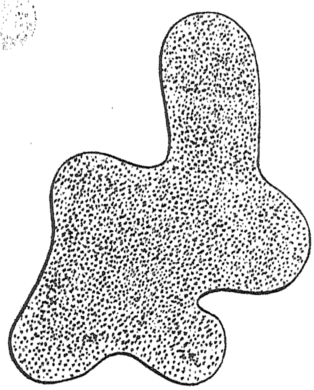

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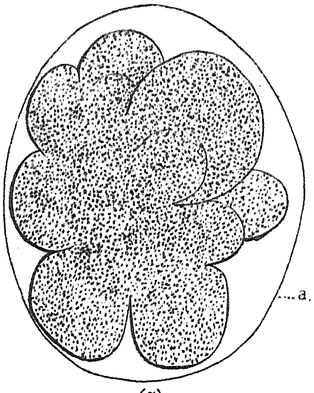

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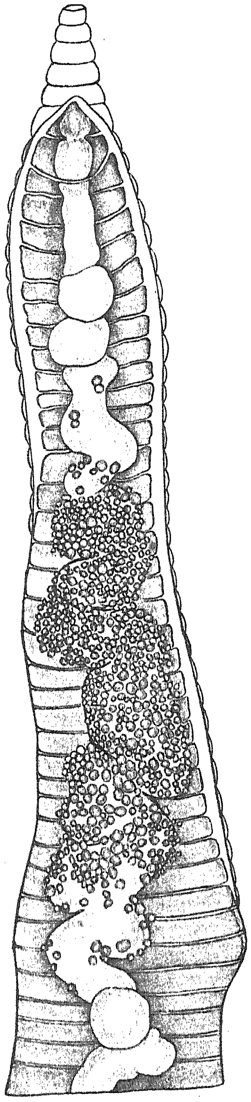

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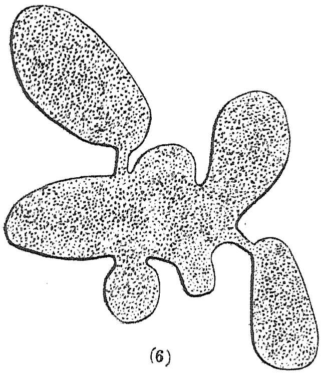

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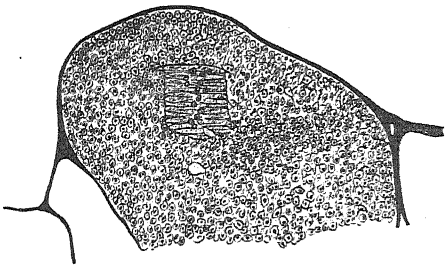

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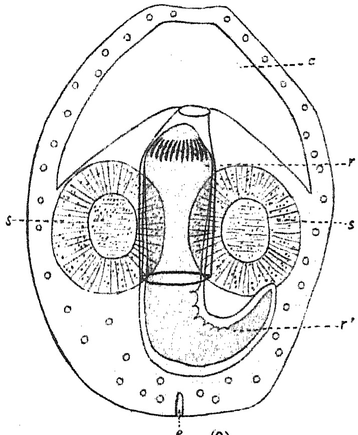
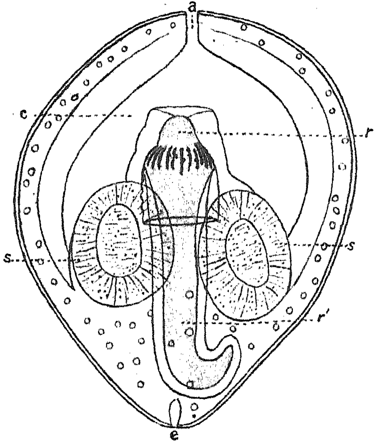


(8)

W.A.H. et J.P.H. del.

H.S. Burton, Lith.



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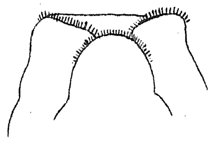

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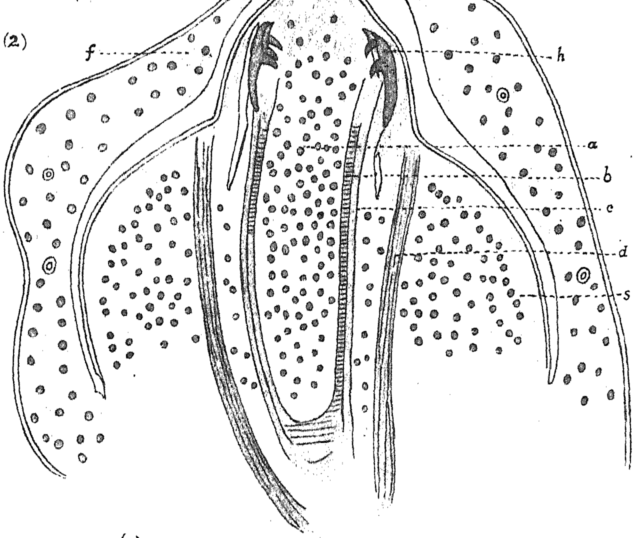

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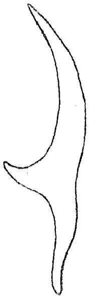

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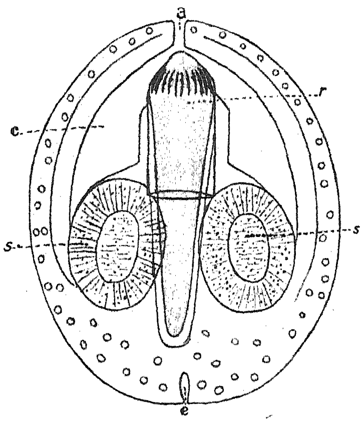

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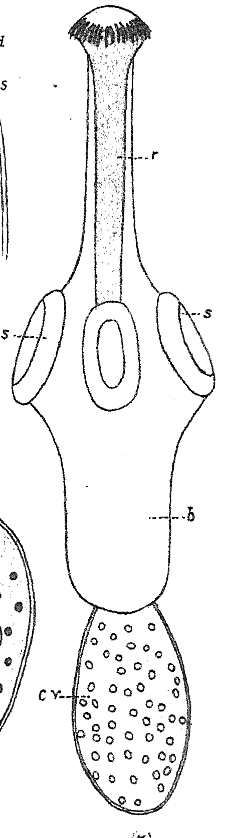

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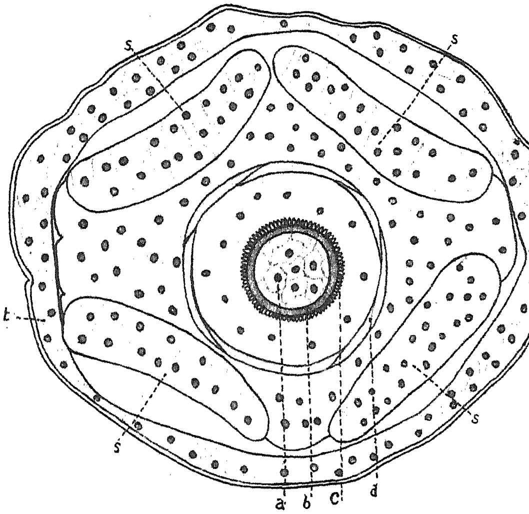

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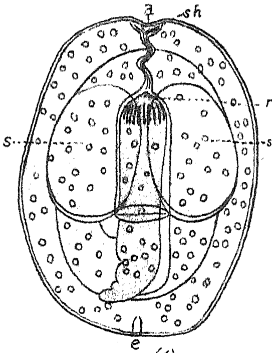

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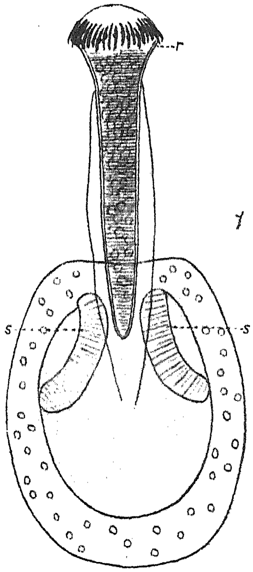
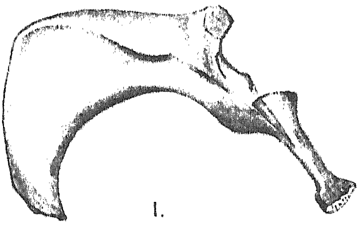


(6)

W.A.H. del.

H.S.Burton Lith.



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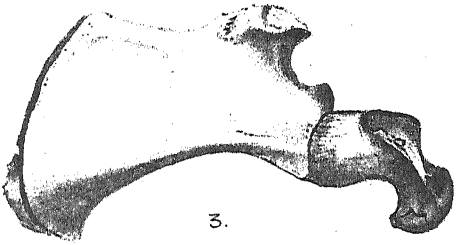

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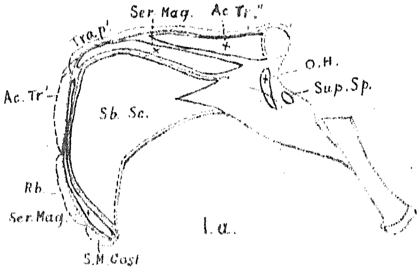

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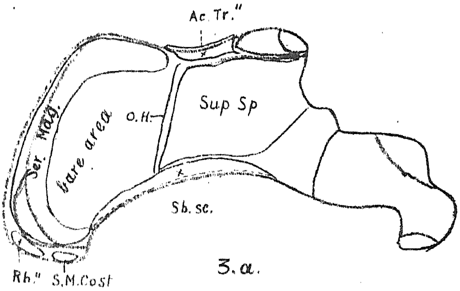

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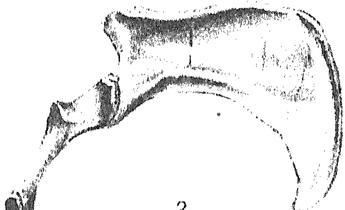

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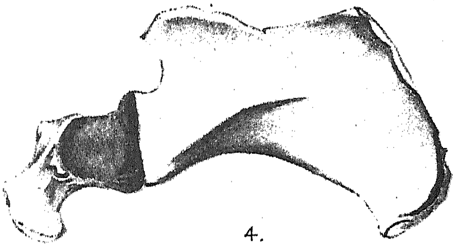

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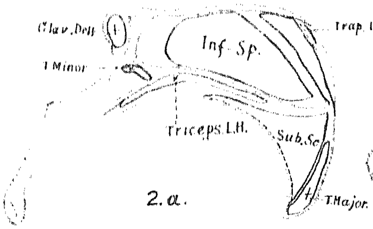

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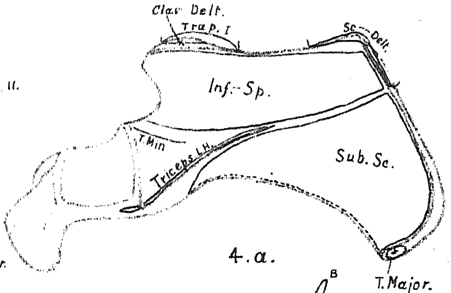

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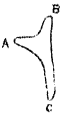

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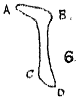

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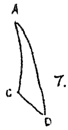

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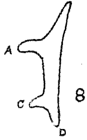
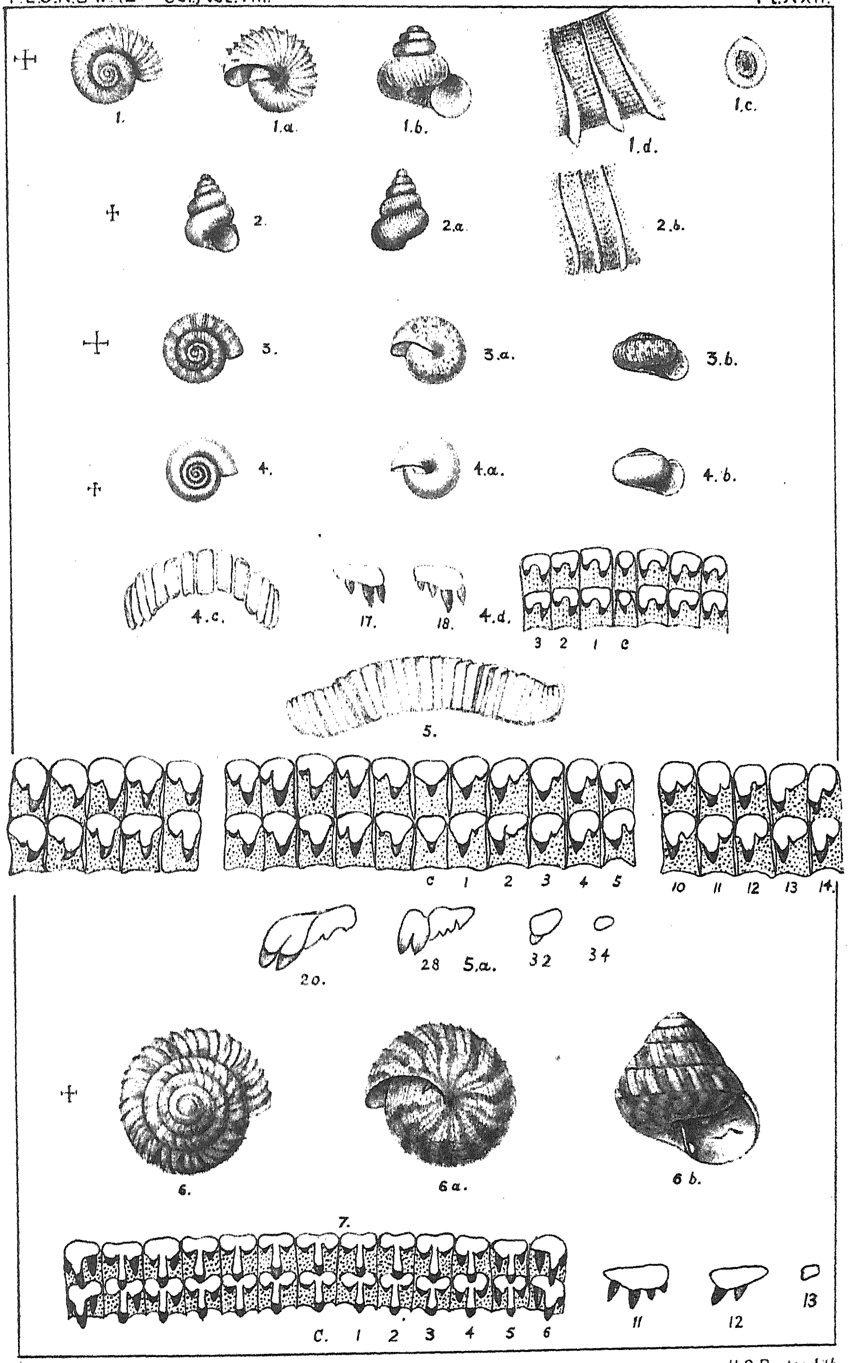


8.

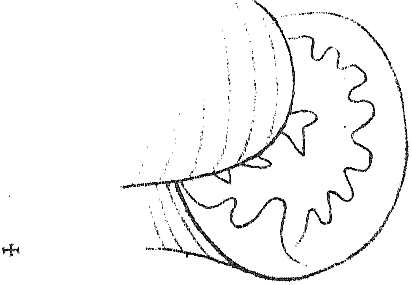
G.H.B. del.

H.S. Burton, Lth.



H. Suter del. ad nat.

H. S. Burton, Lith.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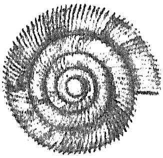
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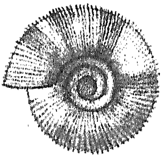
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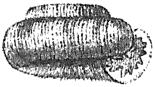
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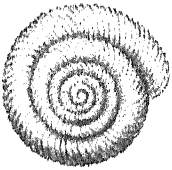
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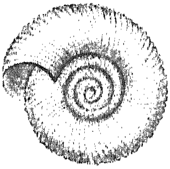
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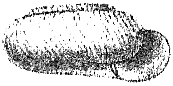
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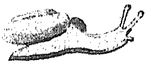
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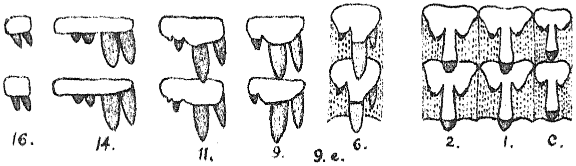
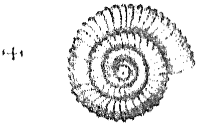


9. e.

9. d.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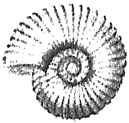
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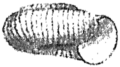
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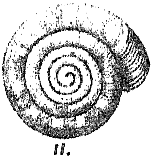
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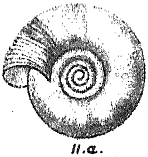
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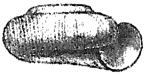
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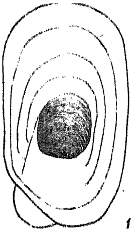
H. Suter. del. ad nat. H. S. Burton Lth.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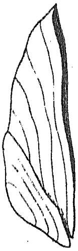

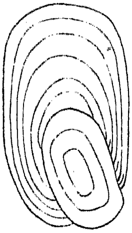
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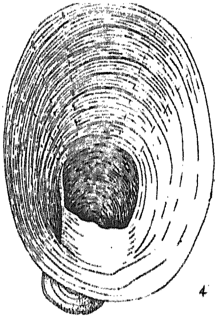
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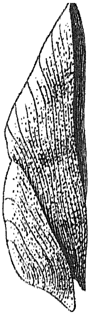

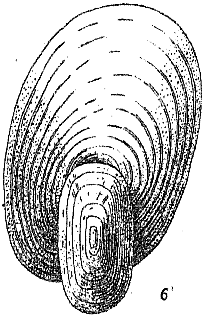
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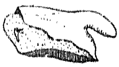
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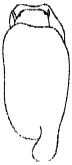
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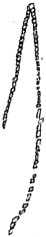
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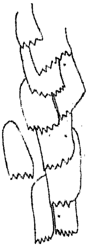
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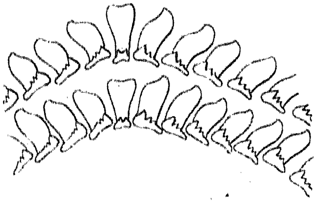
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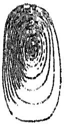
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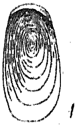
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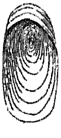
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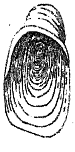
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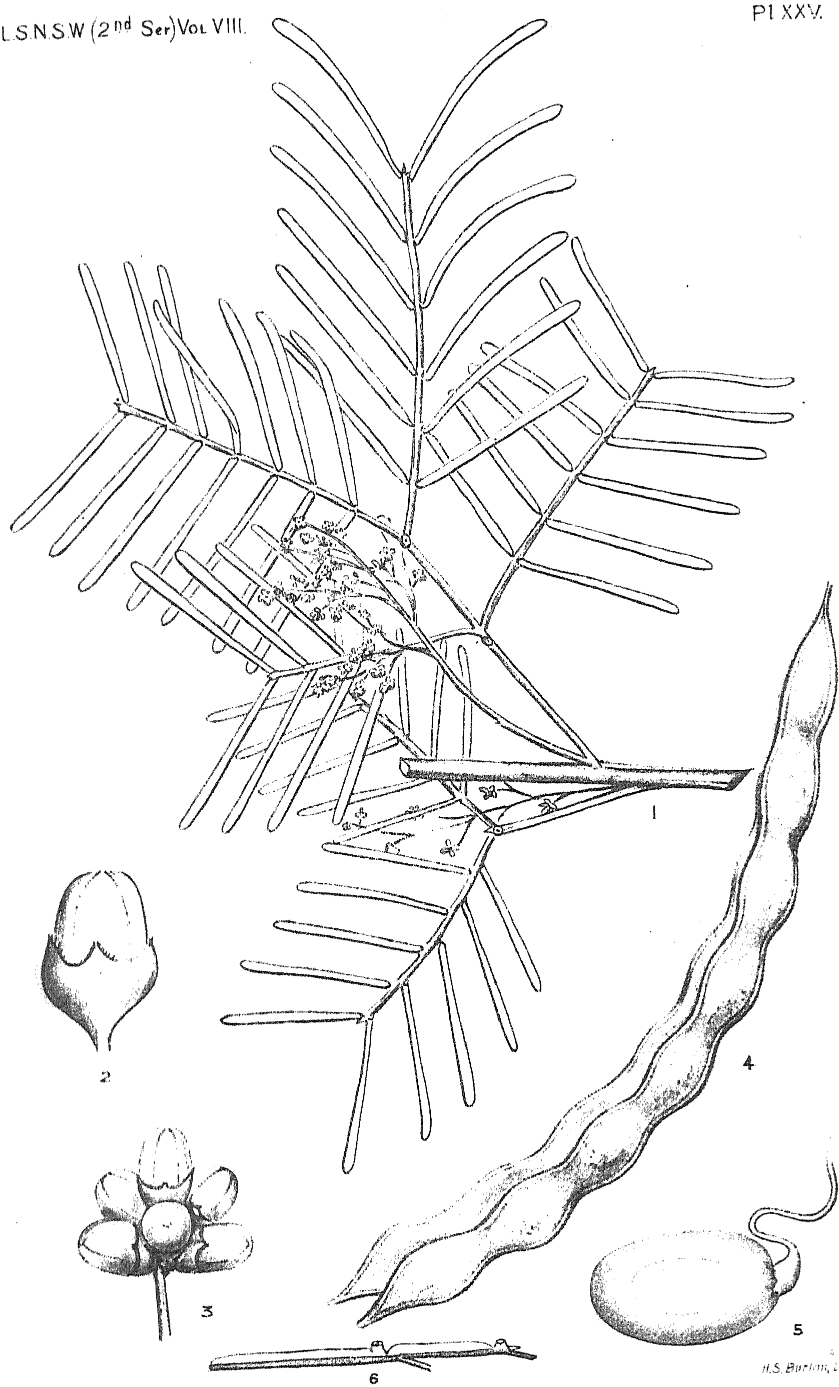
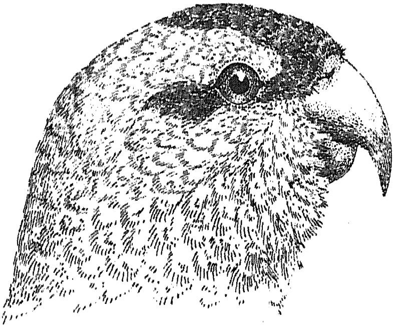
C. Hedly, del.

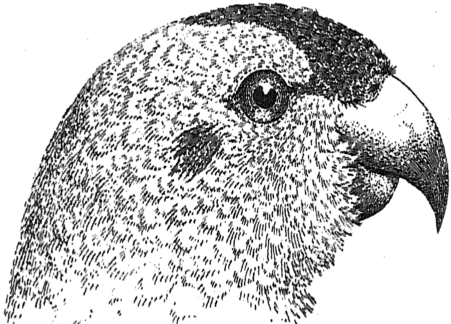


H.S. Burton, Lith

R.T.Baker, del. ad nat.

ACACIA MUELLERIANA, J.H.M et R.T.B.

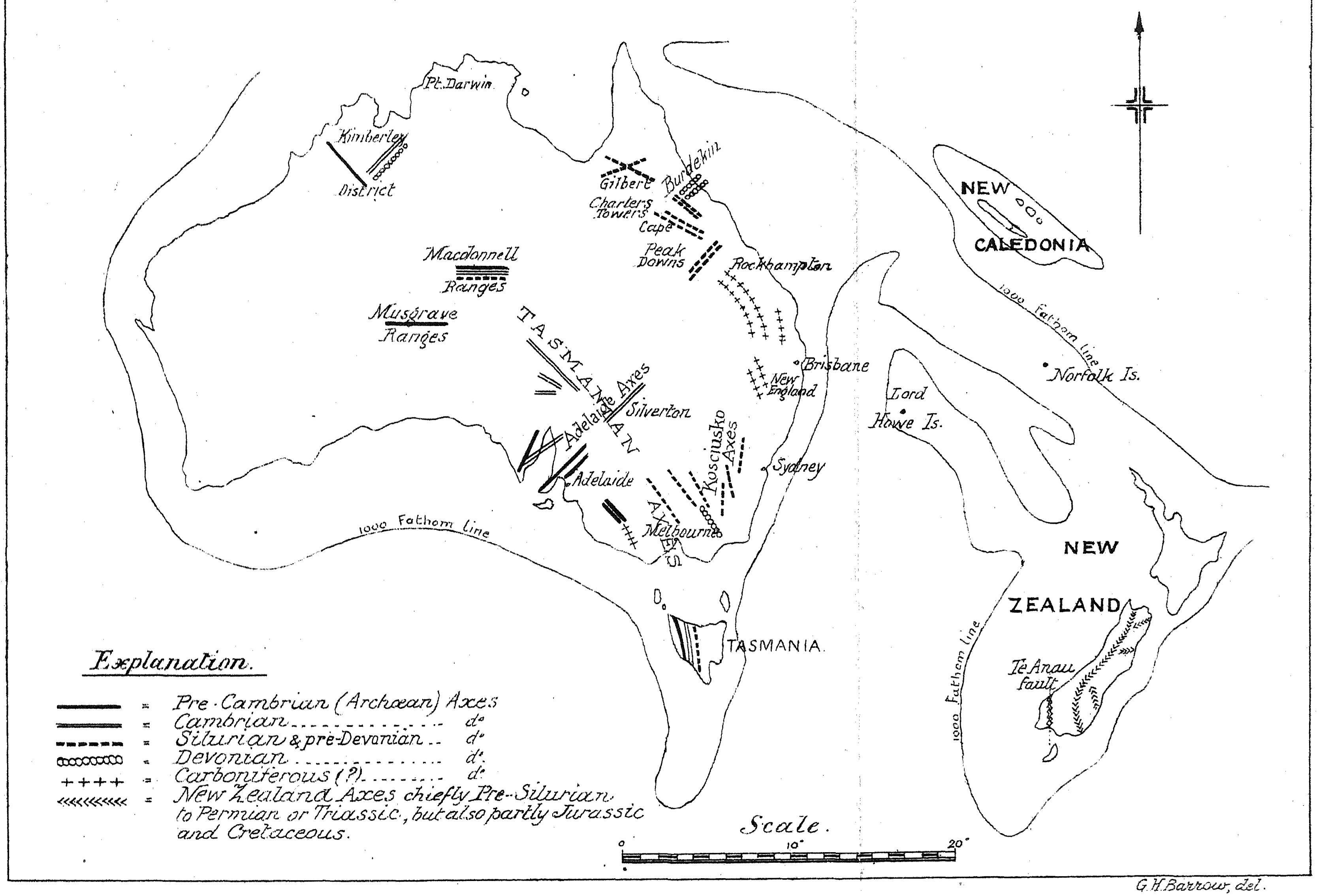




2.

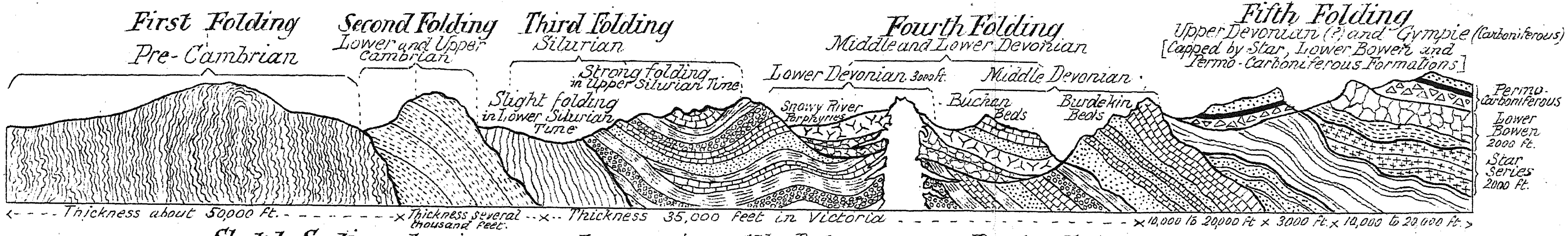
MAP SHOWING THE CHIEF DIRECTIONS OF FOLDING AT PRESENT KNOWN IN AUSTRALIA, TASMANIA, AND NEW ZEALAND.

The Anticlines of the New Zealand folds are reproduced from the Sketch by Captn Hutton F.R.S. (Quart. Jour. Geol. Soc. May 1885 p. 195)



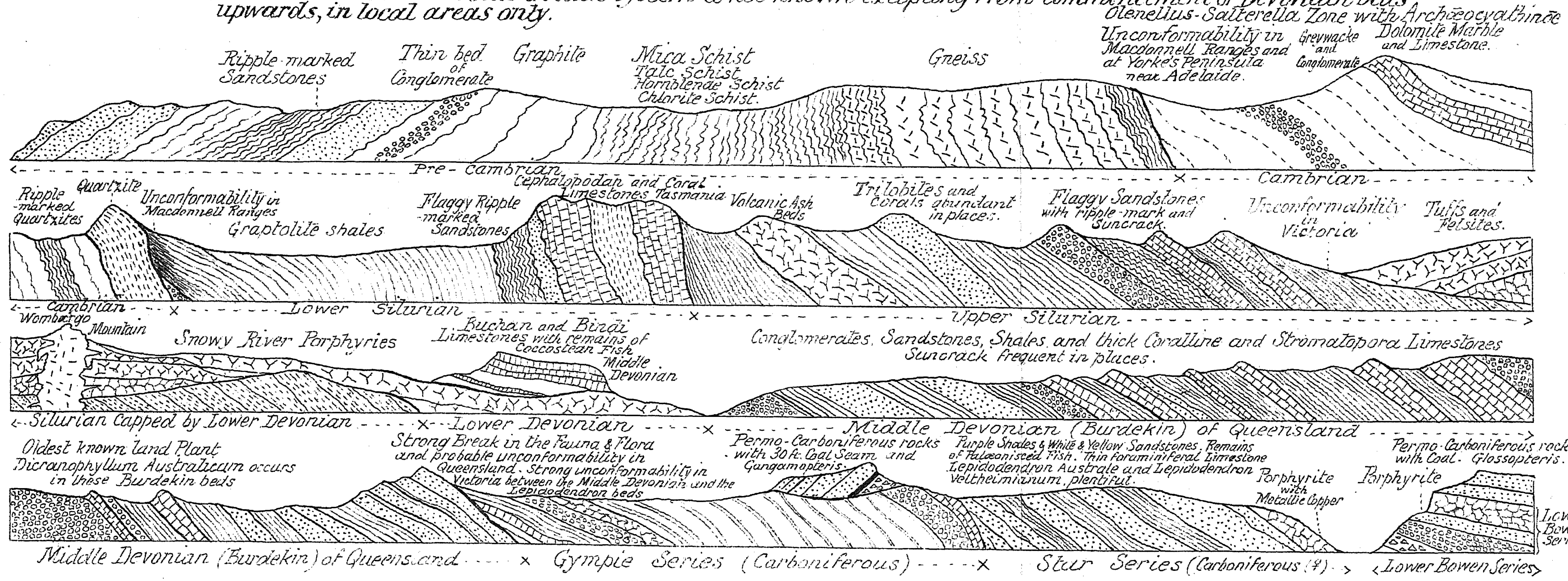
G. H. Barrow, del.

Generalised Geological Sketch Section showing the successive Foldings of Australia from Pre-Cambrian Time to the close of the Permo-Carboniferous Period.


First Folding
Pre-Cambrian
Second Folding
Lower and Upper Cambrian
Third Folding
Silurian
Slight folding in Lower Silurian Time
Strong folding in Upper Silurian Time
Fourth Folding
Middle and Lower Devonian
Lower Devonian 3000 ft.
Snowy River Porphyries
Middle Devonian
Buchan Beds
Burdekin Beds
Fifth Folding
Upper Devonian (?) and Gympie (Carboniferous)
[Capped by Star, Lower Bowen and Permo-Carboniferous Formations]
Permo-Carboniferous
Lower Bowen 2000 ft.
Star Series 2000 ft.
<---- Thickness about 50,000 ft. --------- × Thickness several thousand feet. -- × -- Thickness 35,000 feet in Victoria ----------- × 10,000 to 20,000 ft × 3000 ft. × 10,000 to 20,000 ft. >

Sketch Section showing general succession of the Palæozoic and Pre-Cambrian rocks of Australia.

The exact order of the beds in each system is not known excepting from commencement of Devonian beds upwards, in local areas only.


Ripple-marked Sandstones
Thin bed of Conglomerate
Graphite
Mica Schist
Talc Schist
Hornblende Schist
Chlorite Schist.
Gneiss
Olenellus-Salterella Zone with Archæocyathinæ
Unconformability in Macdonnell Ranges and at Yorke's Peninsula near Adelaide.
Greywacke and Conglomerate
Dolomite Marble and Limestone.
<---------- Pre-Cambrian ---------- × ---- Cambrian ---->
Ripple-marked Quartzites
Quartzite
Unconformability in Macdonnell Ranges
Graptolite shales
Flaggy Ripple-marked Sandstones
Cephalopodan and Coral Limestones Tasmania
Volcanic Ash Beds
Trilobites and Corals abundant in places.
Flaggy Sandstones with ripple-mark and Suncrack.
Unconformability in Victoria
Tuffs and Felsites.
<-- Cambrian -- × ------ Lower Silurian ------ × ------ Upper Silurian ------>
Wombat Mountain
Snowy River Porphyries
Buchan and Bindi Limestones with remains of Coccostean Fish
Middle Devonian
Conglomerates, Sandstones, Shales, and thick Coralline and Stromatopora Limestones
Suncrack frequent in places.
<- Silurian Capped by Lower Devonian ---- × -- Lower Devonian ---- × ---- Middle Devonian (Burdekin) of Queensland ---->
Oldest known Land Plant Dicranophyllum Australicum occurs in these Burdekin beds
Strong Break in the Fauna & Flora and probable unconformability in Queensland. Strong unconformability in Victoria between the Middle Devonian and the Lepidodendron beds
Permo-Carboniferous rocks with 30 ft. Coal Seam and Gangamopteris.
Purple Shales & White & Yellow Sandstones. Remains of Palæoniscid Fish. Thin foraminiferal Limestone Lepidodendron Australe and Lepidodendron Veltheimianum, plentiful.
Porphyrite with Metallic Copper
Porphyrite
Permo-Carboniferous rocks with Coal. Glossopteris.
Lower Bowen Series
Middle Devonian (Burdekin) of Queensland ---- × Gympie Series (Carboniferous) ---- × Star Series (Carboniferous (?) -> <Lower Bowen Series>

G. H. Barrow del.

I. A. R. I. 75.

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